CHAPTER 3. AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This chapter summarizes the physical, biological, social, and economic environments of the project area and the effects of implementing each Alternative on that environment. It also presents the scientific and analytical basis for the comparison of Alternatives presented in the previous chapter.

Introduction

Analysis Framework

The baseline for the affected environments and environmental consequences described in the sections below is the existing condition as described in Alternative A in Chapter 2. In general, this baseline includes existing NFS and unauthorized routes identified in the forest route inventory, combined with isolated cross-country motor vehicle travel, no seasonal closure, no restriction on wheeled over-the-snow travel, and no specific prohibitions on the use of public wheeled motor vehicles for parking and dispersed camping. In addition to this baseline, there are currently 680 miles of surfaced NFS ML 3-5 roads already designated on the Forest for public highway-licensed wheeled motor vehicle use, 334 miles of State and County roads, and 249 miles of designated roads and 62 miles of designated trails in the Rock Creek area as described in the Background section in Chapter 1.

Project Area

The project area includes all NFS lands within the ENF, except for those included in the Rock Creek Recreational Trails Area. All existing routes identified in the forest route inventory, including surfaced NFS ML 3-5 roads already designated for public wheeled highway-licensed motor vehicle use only, are considered part of the project area and existing condition. The project area map is located in the Executive Summary at the beginning of this FEIS.

Data

The primary data source used for this analysis was existing GIS data, collected from past field surveys and inventories. The ENF has numerous GIS layers that contributed to conducting an effective analysis, such as: spotted owl protected activities centers, northern goshawk protected activities centers, riparian conservation area boundaries, hydrologic watersheds, inventoried roadless areas, dispersed camping areas, vegetation, sensitive plant occurrences, and recorded cultural resource sites.

The second data source used for this analysis originated from route evaluations forms (see project record) completed by Forest specialists, District OHV managers, and a variety of District program managers and field personnel. Forest specialists completed forms for targeted routes of

The third data source used for this analysis was collected in the field by the Forest trails specialist and Recreation specialist for this project. Field assessments and photo documentation were collected on specific routes of concern identified by project specialists and all unauthorized routes proposed to allow use as NFS ML-2 roads and NFS trails in Alternatives B, Modified B, C, D, E. Primary field measurements on these routes included: (1) route conditions to assess vertical and horizontal alignments, soil stability and compaction, potential resource problems (e.g. proximity to sensitive resources and signs of route proliferation), and indications of natural revegetation and rehabilitation of routes; and (2) potential for enhancing the motorized recreation system.

Finally, cultural resource inventory surveys were conducted in the field by a Forest archaeologist on all moderate to high use unauthorized routes proposed for designation in the alternatives, as directed by the Region 5 OHV Programmatic Agreement (USDA FS 2006). These surveys involved the identification of cultural sites on or adjacent to these routes.

Assumptions

- For this analysis, the following assumptions were applied in all sections below:
- Public education and enforcement of regulations will generally limit public travel to
- designated routes.
- Routes with fixed barriers are closed and are expected to revegetate.
- Roads designated for public wheeled motor vehicle use are subject to hazard tree removal.
- NFS roads designated for public wheeled motor vehicle use will be maintained, as needed.
- Trails designated for public motor vehicle use will be maintained, as needed.
- NFS roads and trails are in an acceptable condition, unless information exists to the contrary. This is based on the fact that most NFS roads and trails were constructed with engineering design.
- Unauthorized routes may not be in an acceptable condition, unless site specific information exists to the contrary. This is based on the fact that unauthorized routes were created without engineering design.

Cumulative Effects Analysis

For past, present, and reasonably foreseeable future actions that may potentially contribute to cumulative effects, a comprehensive list of such actions has been compiled (Appendix E). This list was used as a reference for all cumulative effects analyses conducted within each section and identifies the temporal scale being considered for past, present, and reasonably foreseeable future actions for the cumulative effects analyses conducted within each section. The reason that the list of past actions goes back 10 years is because vegetation changes resulting from management actions prior to 1997 are captured in the forest vegetation inventory. In addition to this list, past actions identified for the cumulative watershed effects (CWE) analysis is available in the project record. The list of present actions includes all projects currently undergoing implementation. The list of future foreseeable actions includes those projects on the Forest Schedule of Proposed Actions (SOPA), which is posted on the ENF website. The reason that future foreseeable actions only go as far is those projects identified in the current SOPA is because they are known projects that are likely to occur in the foreseeable future.

Finally, the cumulative effects analyses conducted includes the existing baseline condition combined with 334 miles of State and County roads and 249 miles of designated roads and 62 miles of designated trails in the Rock Creek area as described in the Background section in Chapter one.

A Air Quality

This analysis examines area weather and meteorology and any potential for public wheeled motor vehicle travel to cause or contribute to violations of National and State Ambient Air Quality Standards (AAQS), to degrade air quality by more than any applicable Prevention of Significant Deterioration (PSD) increment, to affect Class I areas, or to cause or contribute to visibility impairment beyond any existing conditions.

Affected Environment

Air quality is managed through a series of federal, state, and local laws and regulations designed to assure compliance with the Clean Air Act. A summary of how the regulations apply to this project is provided here.

Ambient air quality standards (AAQS) define clean air, and are established to protect even the most sensitive individuals in our communities. An air quality standard defines the maximum amount of a pollutant that can be present in outdoor air without harm to the public's health. Both the Air Resources Board (ARB) and the U.S. Environmental Protection Agency (EPA) are authorized to set ambient air quality standards (CARB 2007).

Table 3-A.1: EPA and CARB established Standards for pollutants

Ambient Air Quality Standards				
Pollutant	Averaging Time	California Standards	Federal Standards	
		Concentration	Primary	Secondary
Carbon Monoxide (CO)	8 Hour	9.0 ppm (10 mg/m3)	9.0 ppm (10 mg/m3)	None
Nitrogen Dioxide (NO2)	1 Hour	.18 ppm (338 ug/m3)	-	Same as primary
Sulfur Dioxide (SO2)	24 Hour	.04 ppm (105 ug/m3)	.14 ppm (365 ug/m3)	-
Particulate Matter 10 microns (PM10)	24 Hour	50 ug/m3	150 ug/m3	Same as primary
Particulate Matter 2.5 microns (PM2.5)	24 Hour	No separate state standard	35 ug/m3	Same as primary
Ozone (O3)	8 Hour	.070 ppm (137 ug/m3)	.08 ppm (157 ug/m3)	Same as primary

Smog is the general term used to describe a variety of air pollutants which react with each other in sunlight, including ground-level ozone (smog's main ingredient), particulate matter, carbon monoxide and nitrogen oxides.

Carbon Monoxide (CO) is a colorless, odorless gas by-product of combustion that is produced primarily by motor vehicles. In addition, burned wood and charcoal also emit carbon monoxide. The highest concentrations of CO are generally associated with cold stagnant weather conditions that occur during winter. CO problems tend to be localized. CO replaces oxygen in the body's red blood cells. People with heart disease are more susceptible to developing chest pains when exposed to low levels of CO. Exposure to high levels of carbon monoxide can slow reflexes and cause confusion and drowsiness and result in death in confined spaces (an enclosed garage) at very high concentrations.

Nitrogen Dioxide (NO2) is a reactive gas capable of damaging the cells lining the respiratory tract.

Sulfur Dioxide (SO2) is a strong smelling, colorless gas that is formed by the combustion of fossil fuels. Power plants, which may use coal or oil high in sulfur content, can be major sources of sulfur dioxide. Sulfur Dioxide and other sulfur oxides contribute to the problem of acid deposition.

Particulate Matter (PM) is a term used for a mixture of solid particle, and liquid droplets, found in the air. It originates from a variety of sources, including motor vehicles, power plants, construction activities, soil dust, soot and industrial processes. Course particles (PM10) are generally emitted from sources such as windblown dust, vehicles traveling on unpaved roads, and crushing /grinding operations. Fine particles (PM2.5) can come from fuel combustion (motor vehicles, power generation, industrial facilities) and fugitive dust. PM 2.5 is formed primarily in the atmosphere from gases such as sulfur oxides, oxides of nitrogen (NOx), and volatile organic compounds (VOCs). The tiny particles can be easily inhaled deep into the lungs and may cause a variety of harmful health effects.

Ozone (ground-level, O3) is a colorless, odorless pollutant formed by a chemical reaction between VOCs and NOx in the presence of sunlight. The primary contributors of VOCs and NOx are mobile sources including cars, trucks, buses, plus agricultural and construction equipment. In contrast, stratospheric ozone in the upper atmosphere, better known as the ozone layer, shields the earth from the suns harmful ultraviolet rays. Ozone is a strong irritant that can constrict the airways, forcing the respiratory system to work harder to provide oxygen.

California is divided into 15 air basins with boundaries that are based on geographical and meteorological considerations and follow political boundaries to the extent practicable. This project is within Alpine, Amador, El Dorado, and Placer Counties. These counties are in the Mountain Counties air basin, with a small part of El Dorado and Placer Counties in the Lake Tahoe air basin. This project resides in the Mountain Counties air basin only. The population, area, and emissions for the State, air basin, and counties are shown in the table below.

Table 3-A.2. Average daily emissions' (2005)

	California State	Mountain Counties Air Basin	Alpine County	Amador County	El Dorado County	Placer County
Population	37,033,482	447,754	1,241	37,771	174,949	310,689
Area (square miles)	156,850	12,500	727	601	1,805	1,507
Pollutant (from all sources in tons/day)						
Total Organic Gases (TOG)	5852	187	9	19	34	67
Reactive Organic Gases (ROG)	2430	103	6	9.0	18	27
Carbon Monoxide (CO)	13766	799	65	43	124	169
Nitrogen Oxides (NOx)	3219	58	2	7.0	12	30
Sulfur Oxides (SOx)	302	4.0	0.5	0.2	0.3	1.0
Particulate Matter 10 microns (PM^{10})	2212	138	12	9.0	21	25

NOTE: The United States Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) each established standards for six pollutants: particulate matter less than 10 microns in diameter (PM^{10}), Sulfur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Ozone (O_2), Carbon Monoxide (CO), and Lead (Pb).

The 1990 amendment of the Clean Air Act published the General Conformity Rule. It states that in federal non-attainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination must be made that the emissions will not exceed a de minimis (threshold) level (tons per year). The threshold level for VOCs and NOx is 25 tons per year per project, respectively (El Dorado County 2002). If the action exceeds the threshold level, then a conformity determination is required to document how the federal action will not: (1) cause or contribute to any new violation of any standard in any area; (2) increase the frequency or severity of any existing violation of any standard in any area; or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below threshold levels the project is considered exempt from conformity determination with the State Implementation Plan, regardless of cumulative effects.

The project area is within a designated non-attainment area for state standards for PM^{10} and ozone. For federal standards, the project area is designated in the severe non-attainment category for ozone. A non-attainment designation indicates that the air quality violates an ambient air quality standard. Although a number of areas may be designated as non-attainment for a particular pollutant, the severity of the problem can vary greatly. To identify the severity of the problem, the areas are assigned a classification that is commensurate with the severity of the air quality problem (moderate, serious, and severe). New air quality plans and emission controls strategies will continue to reduce emissions and move areas closer to attainment for ozone.

The air quality across the Forest is fair, due to limited emission sources and vigorous wind dispersion. The sources of emissions in the project area include vehicle exhaust, road dust, harvest activities, wood smoke from residential areas, smoke from pile burning, broadcast burning, and wildfires. Air quality can be severely impacted by particulate matter and other pollutants during large wildfire events. Impacts from the 1992 Cleveland Fire on the ENF affected air quality 60 miles away in Reno, NV. Fugitive dust caused by construction and use of native surface roads can produce PM^{10} in quantities great enough to impair the visual quality of the air.

The Clean Air Act Amendments of 1977 require that a program be established to prevent degradation of air quality in pristine areas and that Air Quality Related Values (AQRVs) of Class I areas be protected. Class I areas include national wildernesses greater than 5,000 acres in existence on August 7, 1977, when the amendments were signed into law. Designation as a Class I area allows only very small increments of new pollution above already existing air pollution levels. The closest Class I areas to the project are Desolation and Mokelumne Wildernesses.

The following communities are within or adjacent to the project area and are considered sensitive areas and receptors:

Table 3-A.3: Sensitive areas and receptors within or adjacent to the project area

Community	Distance from Project (miles)	Air Quality
Foresthill	2 miles north of the forest boundary	Good most of the year
Georgetown	1 mile west of the forest boundary	Good most of the year
Placerville	12 miles west of the forest boundary	Good most of the year, affected by smoke from wood stoves during the winter.
Camino	2 miles south of the forest boundary	Good most of the year
Pollock Pines	1 mile south of the forest boundary	Good most of the year
Kyburz	Within the forest boundary	Good most of the year, affected by smoke from wood stoves during the winter.
Grizzly Flat	Adjacent to the forest boundary	Good most of the year
Omo Ranch	1 mile west of the forest boundary	Good most of the year
Pioneer	20 miles of the forest boundary	Good most of the year
Myers	2 miles east of the forest boundary	Good most of the year, affected by smoke from wood stoves during the winter.
South Lake Tahoe	3 miles east of the forest boundary	Good most of the year, affected by smoke from wood stoves during the winter.

Meteorological Factors Related to Air Quality

Topography and weather patterns determine the extent to which airborne particulate matter accumulates within a given area. Weather patterns strongly influence air quality through pollutant dispersion. The primary weather conditions that affect dispersion are atmospheric stability, mixing height, and transport wind speed. Atmospheric stability refers to the tendency for air to mix vertically through the atmosphere and mixing height is the vertical distance through which air is able to mix. The transport wind speed is a measure of the ability to carry emissions away from a source horizontally. These factors determine the ability of the atmosphere to disperse and dilute the released emissions.

The physical shape of landscapes interacts with and controls some weather patterns that influence emission dispersion. On a local or regional basis, the air flow in California is channeled by mountain ranges. The predominant wind direction in a valley is parallel to the valley's longitudinal axis in one direction, and the second most prevalent wind direction is in the opposite direction.

The general climate of the Mountain Counties air basin varies considerably with elevation and proximity to the Sierra ridge. The terrain features of the air basin make it possible for various climates to exist in relatively close proximity. The pattern of mountains and hills causes a wide variation in rainfall, temperature, and localized winds throughout the basin. Temperature variations have an important influence on basin wind flow, dispersion along mountain ridges, vertical mixing, and photochemistry. The Sierra Nevada receives large amounts of precipitation from storms moving in from the Pacific in the winter, with lighter amounts from intermittent "monsoonal" moisture flows from the south and cumulus buildup in the summer. Precipitation levels are high in the highest mountain elevations, but decline rapidly toward the western portion of the basin. Winter temperatures in the mountains can remain below freezing for weeks at a time, and substantial depths of snow can accumulate. In the western foothills, winter temperatures usually dip below freezing only at night and precipitation is mixed as rain and light snow. In the summer, temperatures in the mountains are mild, with daytime peaks ranging from 70s to low 80s F, but the western end of the air basin can routinely exceed 100 degrees F.

The combination of the topography and meteorology in the Mountain Counties air basin combine determines the effect of local emissions. Regional airflows are affected by the mountains and hills, which direct surface air flows, cause shallow vertical mixing, and create areas of high pollutant concentrations by hindering dispersion. Inversion layers, where warm air overlays cooler air, frequently occur and trap pollutants close to the ground. In the winter, these conditions can lead to carbon monoxide (CO) “hotspots” along heavily traveled roads and at busy intersections. During longer daylight hours in summer, stagnant air, high temperatures, and plentiful sunshine provide the conditions and energy for the photochemical reaction between reactive organic compounds (ROG) and oxides of nitrogen (NOx) that results in the formation of ozone (O_3). Because of its long formation time, ozone is a regional pollutant rather than a local hotspot problem.

In the summer, the strong upwind valley air flowing into the Mountain Counties air basin from the Central Valley to the west is an effective transport medium for ozone precursors and ozone generated in the Bay Area and the Sacramento and San Joaquin valleys. These transported pollutants predominate as the cause of ozone in the air basin and are largely responsible for exceeding state and federal ozone AAQS in the air basin. The CARB has officially designated the air basin as “ozone impacted” by transport from those areas (CARB 2007).

Fugitive Dust

Significant atmospheric dust arises from the mechanical disturbance of granular material exposed to the air. Dust generated from these open sources is termed “fugitive” because it is not discharged to the atmosphere in a confined flow stream. Common sources of fugitive dust include: native surface roads, agricultural tiling operations, aggregate storage piles, and heavy construction operations.

Fugitive road dust is a result of motor vehicle use on dry road surfaces. The force of wheels moving across the native surfaces causes pulverization of surface material. Dust is lofted by the rolling wheels as well as by the turbulence caused by the vehicle itself. This air turbulence can persist for a period of time after the vehicle passes. The silt content of the road surface layer, the distance traveled, the weight and speed of the vehicle, as well as weather conditions, influence the amount of dust produced. Surfaced roads produce a relatively smaller amount of dust than do native surface roads, especially during dry weather (US EPA 2002).

The quantity of dust emissions from a given segment of native surface road varies linearly with the volume of traffic. Variables which influence the amount of dust produced include the average vehicle speed, the average vehicle weight, the average number of wheels per vehicle, the road surface texture, the fraction of road surface material which is classified as silt (particles less than 75 microns in diameter), and the moisture content of the road surface (US EPA 2002).

Vehicle emissions

California is a diverse state with many sources of air pollution. To estimate the sources and quantities of pollution, the ARB, in cooperation with local air districts and industry, maintains an inventory of California emission sources. Sources are subdivided into four major emission categories: stationary sources, area-wide sources, mobile sources, and natural sources (CARB 2007).

Stationary source emissions are based on estimates made by facility operators and local air districts. Emissions from specific facilities can be identified by name and location. Area-wide emissions are estimated by ARB and local air district staffs. Emissions from areawide sources may be either from small individual sources, such as residential fireplaces, or from widely distributed sources that cannot be tied to a single location, such as consumer products and dust from unpaved roads. Mobile source emissions are estimated by ARB staff with assistance from districts and other government agencies. Mobile sources include on-road cars, trucks, and buses and other sources such as boats, off-road recreational vehicles, aircraft, and trains. Natural sources are also estimated by the ARB staff and the air districts. These sources include biogenic hydrocarbons, geogenic hydrocarbons, natural wind-blown dust, and wildfires.

For the inventoried emission sources, the ARB compiles emission estimates for both the criteria pollutants and TACs. The 2007 California Almanac of Emissions and air Quality focuses on five criteria pollutants: ozone, PM, CO, NO_2, and SO_2. Emissions related to these criteria pollutants include reactive organic gases (ROG), oxides of nitrogen (NO_x), CO, oxides of sulfur (SO_x), ammonia (NH_3), and directly emitted PM_{10} and $PM_{2.5}$ (CARB 2007).

While some pollutants, such as CO, are directly emitted, others are formed in the atmosphere from *precursor emissions*. Such is the case with ozone, which is formed in the atmosphere when ROG and NO_x precursor emissions react in the presence of sunlight. PM which includes PM_{10} and $PM_{2.5}$, is a complex pollutant that can either be directly emitted or formed in the atmosphere from precursor emissions. PM precursors include NO_x, ROG, SO_x, and NH_3. Examples of directly emitted PM include dust and soot.

Hydrocarbon is a general term used to describe compounds comprised of hydrogen and carbon atoms. Hydrocarbons are classified as to how photochemically reactive they are: relatively reactive or relatively non-reactive. Emissions of *Total Organic Gases* (TOG) and *Reactive Organic Gases* (ROG) are two classes of hydrocarbons measured for California’s emissions inventory. TOG includes all hydrocarbons, both reactive and non-reactive. In contrast, ROG includes only the reactive hydrocarbons.

Vehicle emissions in the project area are most concentrated along secondary highways 49, 50, and 88. The Forest does not have jurisdiction on vehicle use levels or emissions in any of these concentrated motorized areas. Recreation motorized use and emissions in the project area are more localized to roads and motorized trails, with generally sufficient wind dispersion to avoid air quality concerns. The EPA has set standards for emissions of nonroad engines and vehicles (snowmobiles, ATVs, boats, etc.). The standards for emissions of oxides of nitrogen (NOx), hydrocarbons (HC), and carbon monoxide (CO), are to ensure compliance with the Clean Air Act, and to regulate those emissions that contribute significantly to the formulation of ozone and carbon monoxide. Compliance with these standards requires manufacturers to apply existing gasoline or diesel engine technologies to varying degrees, depending on the type of engine (US EPA 2002).

Toxic Air Contaminants

The 1990 amendment to the Clean Air Act included a list of 189 pollutants identified as hazardous to human health. These pollutants are known, or have the potential, to cause cancer, mutations, be toxic to nervous tissue, or reproductive dysfunction. The ARB defines a toxic air contaminant or TAC as an, “air pollutant which may cause or contribute to tan increase in mortality or serious illness, or which may pose a hazard to human health”. TACs are usually present in minute quantities in the ambient air. However, their high toxicity or health risk may pose a threat to public health even at very low concentrations. In general, for those TACs that may cause cancer, there is no concentration that does not present some risk. In other words, there is no threshold level below which adverse health impacts are not expected to occur. This contrasts with the criteria pollutants for which acceptable levels of exposure can be determined and for which the State and federal governments have set ambient air quality standards.

The majority of the estimated health risk from TACs can be attributed to relatively few compounds, the most important being PM from diesel-fueled engines (diesel PM). In addition to diesel PM, benzene and 1,3-butadiene are also significant contributors to overall public health risk in California. The following table includes information for ten TACs: acetaldehyde, benzene, 1,3-butadiene, carbon tetrachloride, hexavalent chromium, para-dichlorobenzene, formaldehyde, methylene chloride, perchloroethylene, and diesel PM. These ten compounds pose the greatest known health risks based on air quality data, or concentration estimates in the case of diesel PM. The following table displays the 2006 TAC emissions statewide and for the counties within the project area (CARB 2007).

Table 3-A.4: 2006 Statewide and Mountain Counties TAC Emissions (tons/year)

TAC	Statewide	Amador	El Dorado	Placer
Acetaldehyde	10,023	32	86	40
Benzene	12,060	28	73	38
1,3-Butadiene	3,589	7	18	22
Carbon Tetrachloride	2	0	0	0
Chromium, Hexavalent	1	< .01	< .01	< .01
para-Dichlorobenzene	1,469	1	6	1
Formaldehyde	23,154	53	135	81
Methylene Chloride	6,527	5	17	7
Perchloroethylene	4,865	5	18	4
Diesel PM	42,326	27	43	139

Another contributor to TACs are serpentine soils which may contain asbestos. Asbestos minerals belong to either the serpentine mineral group or the amphibole mineral group. The most common type of asbestos found in California is chrysotile, a serpentine mineral; other types include tremolite asbestos and actinolite asbestos which are amphibole minerals. State and federal health officials consider all types of asbestos to be hazardous. No safe asbestos exposure level has been established for residential areas.

The Division of Mines and Geology of the Department of Conservation (DOC) compiled an environmental-asbestos map for western El Dorado County, California. The purpose of the map was to provide information to local, state and federal agencies and the public as to where natural occurrences of asbestos are most likely to be found in El Dorado County. The map is primarily a computer mapping (GIS) compilation of a number of previously available and unpublished geologic and soil maps. The map and report were peer reviewed by a technical committee comprised of geologists from state, federal and county government agencies, universities, private consulting, and individuals with land-use planning experience. The map and report are located in the project file.

Climate Change

The earth's climate has been warming for the past century. It is believed that this warming trend is related to the release of certain gases, commonly referred to as "greenhouse gases", into the atmosphere. The greenhouse gases (GHG) include carbon dioxide (CO^2), methane (CH^4), nitrous oxide (N^2O), and hydrofluorocarbons. Climate research has identified other greenhouse agents that can drive climate change, particularly tropospheric ozone, atmospheric ozone, and atmospheric aerosols (particles containing sulfate, black carbon or other carbonaceous compounds).Greenhouse gases absorb infrared energy that would otherwise be reflected from the earth. As the infrared energy is absorbed, the air surrounding the earth is heated. An overall warming trend has been recorded since the late 19th century, with the most rapid warming occurring over the past two decades. The 10 warmest years of the last century all occurred within the last 15 years, and it appears that the decade of the 1990s was the warmest in human history (CARB 2007).

Projected future climate change may affect California in a variety of ways. Public health can suffer due to; an increase in extreme temperatures and severe weather events resulting in, escalating transmission of infections, disease, and air pollution. Agriculture is especially vulnerable to altered temperature and rainfall patterns, and new pest problems. Forest ecosystems would face increased fire hazards and would be more susceptible to pests and diseases. The Sierra snowpack that functions as the state's largest reservoir could shrink by one third by 2060, and to half its historic size by 2090. Runoff that fills reservoirs will start in midwinter, not spring, and rain falling on snow will trigger more flooding. The California coast is likely to face a rise in sea level that could threaten its shorelines. Sea level rise and storm surges could lead to contamination of drinking water, and damage to roads, causeways, and bridges.

California has been studying the impacts of climate change since 1988, when the legislature approved AB 4420. This legislation directed the California Energy Commission (CEC), in consultation with the ARB and other agencies, to study the implications of global warming on California's environment, economy, and water supply. The CEC was also directed to prepare and maintain the State's inventory of GHG emissions. In 2002, recognizing that global warming would impact California, the legislature approved AB 1493. This bill directed the ARB to adopt regulations to achieve the maximum feasible and cost-effective reduction of greenhouse gas emissions from motor vehicles. The ARB's staff implementation proposal of these regulations was approved by the ARB in September 2004. These regulations will be reviewed and may be modified by the California Legislature. AB 1803 was approved in 2006. This bill directed the ARB to prepare, adopt and update the greenhouse gas emission inventory formerly required to be adopted and updated by the CEC. Also approved was the California Global Warming Solutions Act of 2006 (AB 32). Among the several new responsibilities for ARB is the requirement to establish the 1990 GHG emissions level as a limit to be achieved by 2020 (CARB 2007).

Greenhouse gases emitted by motor vehicles that effect climate change include CO^2, methane (CH^4), nitrous oxide (N^2O) and hydrofluorocarbons (HFCs).

CO^2, CH^4, N^2O emissions resulting directly from operation of the vehicle,

CO^2 emissions resulting from operating the air conditioning system,

Analysis Framework

Introduction

The analysis area under consideration for air quality impacts is the area within a radius of 62 miles from the edge of the project area. The EPA's air quality permitting system suggests that sources within a radius of 62 miles be considered, especially those located downwind of the project.

Cumulative effects for air quality takes into account the impacts of the alternatives when combined with past, present, and foreseeable future actions and events. Past actions may have no effect if the action is no longer contributing emissions to the air. The actions (listed in Appendix E) contributing to cumulative effects were selected because they have caused or have the potential to cause changes in air quality.

Data & Assumptions

For a discussion of the data and assumptions used for this analysis see the first page of Chapter 3.

Indicator Measures

Indicator Measure 1: Effects of fugitive dust produced by public wheeled motor vehicles operating on open routes.

Indicator Measure 2: Effects of vehicle emissions on air quality.

Indicator Measure 3: Effects of public wheeled motor vehicles on air quality within wilderness areas.

Indicator Measure 4: Effects of public wheeled motor vehicles on toxic air contaminants.

Indicator Measure 5: Effects of public wheeled motor vehicles on climate change.

Environmental Consequences

Alternative A

Direct and Indirect Effects

Indicator Measure 1: The direct effects of fugitive dust produced by public wheeled motor vehicles operating on native surface open routes and cross-country, are directly related to the level of use the project area (Forest) receives. Alternative A would not produce fugitive dust beyond the amount produced by routine forest management or user activities. The direct effects of fugitive dust are reduced visibility on and adjacent to roads and increased levels of small diameter particulates (specifically $PM^{2.5}$ and PM^{10}) of concern for human health reasons.

The impact of a fugitive dust source on air pollution depends on the quantity and drift potential of the dust particles injected into the atmosphere. In addition to large dust particles that settle out near the source, considerable amounts of fine particles also are emitted and dispersed over much greater distances from the source. PM^{10} represents a relatively fine particle size range and, as such, is not overly susceptible to gravitational settling.

The potential drift distance of particles is governed by the initial injection height of the particle, the terminal settling velocity of the particle, and the degree of atmospheric turbulence. Theoretical drift distance, as a function of particle diameter and mean wind speed, has been computed for fugitive dust emissions. Results indicate that for a typical mean wind speed of 10 mph, particles larger than about 100 microns in aerodynamic diameter are likely to settle out within 20 to 30 feet from the edge of the route or other point of emission. Particles that are 30 to 100 microns in diameter are likely to undergo impeded settling. These particles, depending upon the extent of atmospheric turbulence, are likely to settle within a few hundred feet of the route. Smaller particles, (particularly Inhalable Particles, PM^{10}, and Fine Particles), have much slower gravitational settling velocities and are much more likely to have their settling rate retarded by atmospheric turbulence.

The indirect effects of fugitive dust produced by public wheeled motor vehicles operating on open routes and cross-country would be related to the use. Indirect effects are limited to the air quality degradation, as a result of $PM^{2.5}$ and PM^{10} particulates, since the larger diameter materials would settle out near the point of production. $PM^{2.5}$ and PM^{10} levels would rapidly disperse as they are carried by local and general winds.

Exposure to PM aggravates a number of respiratory illnesses and may even cause early death in people with existing heart and lung disease. Both long-term and short-term exposure can have adverse health impacts. These finer particles pose an increased health risk because they can deposit deep in the lung and contain substances that are particularly harmful to human health.

Indicator Measure 2: The direct effects of vehicle emissions produced by public wheeled motor vehicles operating on open routes and cross country are: formation of PM 2.5, formation of CO, formation of VOCs and NOx, and production of diesel engine PM.

The indirect effects of vehicle emissions produced by public wheeled motor vehicles operating on open routes and cross country are: air degradation as a result of PM2.5 and PM10; reduced ability of the blood to carry oxygen based on exposure to CO; and formation of ozone in the atmosphere when hydrocarbons and NOx precursor emissions react in the presence of sunlight. Ozone is a strong irritant that can constrict the airways, forcing the respiratory system to work harder to provide oxygen to the rest of the body.

Direct and indirect effects of vehicle emissions on air quality do not result in measurable variations from current conditions, since emissions from public wheeled motor vehicles are spread over much of the project area with generally good emission dispersion. Recreational travel within the project area will not cause or significantly contribute to violations of NAAQs or add to visibility impairment beyond the existing condition. The county emission trends and forecasts for NOx, ROG, and CO are all projected to drop gradually by 2020. The trends and forecasts for PM2.5 and PM10 are project to go up gradually by 2020.

Indicator Measure 3: Public wheeled motor vehicles operating on gravel and native surface roads have the potential to negatively affect air quality within wilderness areas by reducing visibility, especially by dust. Particulates that remain suspended in the atmosphere are efficient light scatterers, and therefore, contribute to regional haze problems. The table below displays the total mileage of native surface roads and trails within one mile of the wilderness boundary, that may contribute negatively to air quality due to dust. Table 3-A.5 displays the breakdown for each of the wilderness areas. Alternative A has the greatest number of miles of native surface roads within one mile of the wilderness boundary and the greatest potential to affect visibility within Class I areas. Currently the AQRV of visibility is considered good to excellent most of the time in these Class I airsheds.

Table 3-A.5: Miles of native surface roads and trails open for public wheeled motor vehicle use within one mile of wilderness boundary

Alternative	Road and Trails (miles)			
	Desolation Wilderness	Mokelumne Wilderness	Caples Creek Recommended Wilderness	Total
A	15.1	66.8	74.4	156.3
B	12.0	48.5	49.1	109.6
Modified B	10.5	52.3	40.8	103.6
C	10.2	44.1	32.6	86.9
D	10.2	44.6	29.2	84.0
E	7.5	19.0	15.8	42.3

Indicator Measure 4: A direct effect of vehicle emissions produced by public wheeled motor vehicles operating on open routes and cross country is the production of diesel engine PM (a TAC). The exhaust from diesel-fueled engines is a complex mixture of gases, vapors, and particles, many of which are known human carcinogens. Diesel PM contributes to the majority of the risk from exposure to diesel exhaust, because the particles carry many of the harmful organics and metals present in the exhaust.

Statewide TAC monitoring started in 1989, so the ARB has substantially increased its knowledge about TACs, and the data indicate that control e increase. There are also uncertainties associated with the magnitude and timing of other consequences due to a warmer planet.

Greenhouse gas concentrations in the atmosphere will increase during the next century unless greenhouse gas emisions decrease substantially from present levels. Increased greenhouse gas concentrations are very likely to raise the Earth's average temperature, influence precipitation and some storm patterns as well as raise sea levels (Climate Change 2007). The magnitude of these changes, however, is uncertain.The amount and speed of future climate change will ultimately depend on:

- Whether greenhouse gases and aerosol concentrations increase, stay the same or decrease.
- How strongly features of the climate (e.g. temperature, precipitation and sea level) respond to changes in greenhouse gas and aerosol concentrations.
- How much the climate varies as a result of natural influences (e.g. from volcanic activity and changes in the sun ’s intensity) and its internal variability (referring to random changes in the circulation of the atmosphere and oceans).

Virtually all published estimates of how the climate could change in the future are produced by computer models of the Earth’s climate system. These models are known as general circulation models (GCMs). According to IPCC, 2007 (Climate Change 2007):

> “[C]onfidence in models comes from their physical basis, and their skill in representing observed climate and past climate changes. Models have proven to be extremely important tools for simulating and understanding climate, and there is considerable confidence that they are able to provide credible quantitative estimates of future climate change, particularly at larger scales. Models continue to have significant limitations, such as in their representation of clouds, which lead to uncertainties in the magnitude and timing, as well as regional details, of predicted climate change. Nevertheless, over several decades of model development, they have consistently provided a robust and unambiguous picture of significant climate warming in response to increasing greenhouse gases.”

It is important to recognize that projections of climate change in specific areas are not forecasts comparable to tomorrow’s weather forecast. Rather, they are hypothetical examples of how the climate might change and usually contain a range of possibilities as opposed to one specific high likelihood outcome.

The United States has the highest emissions of greenhouse gases of any nation on Earth. The Fourth U.S. Climate Action Report concluded, in assessing current trends, that carbon dioxide emissions increased by 20 percent from 1990-2004, while methane and nitrous oxide emissions decreased by 10 percent and 2 percent, respectively. The declines in methane emissions are due to a variety of technological, policy, and agricultural changes, such as increased capture of methane from landfills for energy, reduced emissions from natural gas systems, and declining cattle populations. At least some of the decline in nitrous oxide emissions is due to improved emissions control technologies in cars, trucks, and other mobile sources. (Climate Change, 2007)

Many, but not all, human sources of greenhouse gas emissions are expected to rise in the future. This growth may be reduced by ongoing efforts to increase the use of newer, cleaner technologies and other measures. Additionally, our everyday choices about such things as commuting, housing, electricity use and recycling can influence the amount of greenhouse gases being emitted.

While the evidence for climate change is overwhelming, it is impossible to predict exactly how it will affect California's ecosystems and economy in the future. There are, many areas of concern.

As the average temperature of the Earth increases, weather is affected. Rainfall patterns change. Droughts and flashfloods are likely to become more frequent and intense. Mountain snowcaps will continue to shrink. Climate change and the resulting rise in sea level are likely to increase the threat to buildings, roads, powerlines, etc. Agricultural patterns will change as crops and productivity shift along with the climate change. Physical changes such as these impact California's public health, economy and ecology. We can expect to see a deterioration in air quality, a rise in the number of weather-related deaths, and a possible increase in infectious diseases. Higher temperatures contribute to increased smog, which is damaging to plants and humans. Climate change also affects forests in ways that increase fire hazards and make forests more susceptible to pests and diseases.

One area of considerable concern is the effect of climate change on California's water supply. During the winter, high in the Sierra Nevada, snow accumulates in a deep pack, preserving much of California's water supply in "cold storage" for the hot, dry summer. If winter temperatures become warmer, more precipitation will fall as rain, decreasing the size of the snowpack. Heavier rainfall in the winter could bring increased flooding. Less spring runoff from a smaller snowpack will reduce the amount of water available for hydroelectric power production and agricultural irrigation. Evidence of this problem already exists. Throughout the 20th century, annual April to July spring runoff in the Sierra Nevada has been decreasing, with water runoff declining by about ten percent over the last 100 years.

Another predicted outcome of climate change, a rise in sea level, is already being seen in California, with a 3 - 8 inch rise in the last century. This can lead to serious consequences for the large populations living along California's coast. Sea level rise and storm surges can lead to flooding of low-lying property, loss of coastal wetlands, erosion of cliffs and beaches, saltwater contamination of drinking water, and damage to roads and bridges.

Higher temperatures also cause an increase in harmful air emissions -- more fuel evaporates, engines work harder, and demands for electric power increase along with an increase in power plant air pollution. Air pollution is elevated by increases in natural hydrocarbon emissions from vegetation during hot weather. High temperatures, strong sunlight, and a stable air mass are ideal for formation of ground-level ozone, the most health-damaging constituent of smog. As the temperature rises and air quality diminishes, heat related health problems also increase.

While carbon dioxide is the greenhouse gas emitted in the largest quantity, other greenhouse gases such as methane, nitrous oxide, and hydrofluorocarbons also contribute to climate change. Many greenhouse gases have lifetimes of decades or even centuries in the atmosphere, so the problem cannot be eliminated quickly. Thus, the problems we are experiencing today do not accurately represent the full effects we may see years from now based on current levels of greenhouse gases.

In California, the greenhouse gas emission standards have been incorporated into the current Low-Emission Vehicle (LEV) program, along with the other light and medium-duty automotive emission standards. The standards adopted by the Board phase in during the 2009 through 2016 model years. When fully phased in, the near term (2009-2012) standards will result in about a 22 percent reduction as compared to the 2002 fleet, and the mid-term (2013-2016) standards will result in about a 30 percent reduction.

Cumulative Effects

Indicator Measures 1 - 5: The cumulative effects of fugitive dust on air quality produced by public wheeled motor vehicles operating on open routes and cross-country, would result in only negligible differences than those currently experienced, as $PM^{2.5}$ and PM^{10} particles from road dust combine with other particles produced both by the implementation of other projects on the

Forest such as prescribed burning and harvest operations. Implementation of prescribed burns and harvest operations on other federal, state, or private lands, would also contribute particles. Particulates from industrial and automotive sources within the analysis area would also contribute to the cumulative particulate loading. It is not possible to predict the amount of particulates contributed by these other sources.

Cumulative effects of motorized travel on air resources are unique in that past impacts to air quality are not usually evident. The emissions associated with motorized travel would be cumulative only with local emission sources listed in the affected environment. Since motorized emission sources in the project area are localized and transient, actual cumulative combinations of emissions are minor and do not result in significant effects.

Fugitive dust produced by public wheeled motor vehicles operating on gravel and native surface roads in combination with fugitive dust created by harvest operations on Forest Service and other federal, state, or private lands, could reduce visibility within the Class 1 airsheds slightly.

Diesel PM produced by public wheeled motor vehicles operating on open routes and cross-country in combination with diesel PM created by harvest operations on Forest Service and other federal, state, or private lands, could result in exposure to TACs.

CO^2, CH^4, and N^2O produced by public wheeled motor vehicles operating on open routes and cross-country in combination with CO^2, CH^4, and N^2O created by harvest operations and burning on Forest Service and other federal, state, or private lands, would contribute to greenhouse gases in California.

Direct, Indirect and Cumulative Effects

Indicator Measures 1 - 5: Under Alternatives B, Modified B, C, D, and E, fewer miles of roads and trails are open for motorized use as compared to Alternative A. The effects of the Action Alternatives are the same as described for Alternative A, except that impacts from fugitive dust and vehicle emissions may be reduced because fewer miles of roads and trails would be open for public wheeled motor vehicle use.

B. Geology

Affected Environment

The Eldorado National Forest is located in a geologically complicated area that is composed of bedrock materials from three geologic events in which several oceanic plates have been literally jammed against the western North American Plate over the last 350 million years. The remnants of these plates are linear shaped complexes that have later been “penetrated” by igneous rocks that are commonly referred to as “granitics” (which are further classified as granodiorites, diorites, tonalities and gabbros in some localities). These contorted geologic complexes were later covered by extensive volcanic lava and mud flows that were deposited in river valleys forty million years ago and in a second volcanic sequence that occurred two million years ago. Because the volcanic material is more resistant to bedrock weathering than the underlying metamorphic and granitic rock types, it eventually formed the current ridge tops rather than remaining in valley floors. The technical term for this is an “inverted topography.” Gold deposits are found as placer deposits in these ancient river floors and as “hard rock” deposits within quartz veins that penetrated older geologic materials during the slamming of oceanic materials against the ancient North American continental plate. It was the discovery of the placer gold deposits that resulted in the California gold rush of 1849.

Relative Stability of Bedrock Units

Relative bedrock stability is reflected in the geomorphic materials and processes found in this part of the Sierra Nevada Mountain Range. Geomorphic material includes soils that have weathered in place from bedrock by chemical or mechanical weathering, or have been transported downslope by a combination of gravity and water (both ground and surface waters).

Chemical weathering is the process whereby bedrock minerals “decompose” and form a rind of weathered rock called regolith; if the regolith is further weathered it forms a soil. The granitic rocks in the Sierra Nevada contain minerals that make it susceptible to chemical weathering. Surface water works is its way through the rock mass usually traveling along fractures and joints. Over time this water reacts with the granitic minerals and a chemical process occurs resulting in weathered rock. Some intrusive rocks, such as diorite and gabbro, do no weather as rapidly and are described by geologists as being more resistant than the other granitic rocks. The resulting landforms show differential weathering because weathering rates are different. An example of this differential weathering is the Sugar Loaf hill located near the Silver Fork community on the South Fork of the American River.

Mechanical weathering, in most cases, involves the process of water that is absorbed by the bedrock or enters the bedrock along fractures and joints. The water expands when it freezes and contracts when the ice melts. This freezing and thawing process mechanically breaks the rock apart so that eventually it forms a gravelly soil. Once soil is developed through these chemical or mechanical processes it can be transported downslope by a combination of gravity and water.

Downslope transportation of fractured and weathered material and soil occurs through several geomorphic processes: slope failure by mass-wasting, sheetwash, rainwash, unconcentrated runoff and sheet erosion. Geomorphic deposits from these processes include colluvial soils from slope failures, sheetwash, and rainwash; and alluvial soils from unconcentrated runoff and sheet erosion. Colluvial soils are commonly found from valley floors to ridge tops. Alluvial soils are found on valley floors or in areas where ancient valley floors have been preserved.

When fractured rock fails it moves downslope through one of three processes: fall, landslide, and creep. Rock failure is more prevalent in river canyons such as those found within the American

River watershed as well as the Consumnes and Mokelumne watersheds. Along these steep valley walls the rock debris from the rock failure ranges in size from a few feet in diameter to barn-size boulders. In most cases the rock failure is due to mechanical weathering and in some rare cases the rock failure is from the loss of vegetation. Management activities are therefore unlikely to influence this geomorphic process.

When soil fails it occurs as the loss of soil shear strength and in some cases the loss of root shear strength. As with rock failure there are three types of soil movement: landslide, flow and creep. Debris flows have occurred within the riparian zones of streams within the forest, usually as the result of heavy rainfall and rain-on-snow events. These are naturally occurring for the most part but a few roads and trails have the potential for debris flows initiating from fillslope areas. Failed or plugged culverts usually cause these fillslope failures. In areas where slopes are greater than 57 percent (30°) there is a greater potential for debris flow initiation sites based on field observations and stochastic modeling of slope conditions. Landslide complexes on the forest are commonly deep-seated meaning that the depth to the failure zone is greater than 10 feet deep. Individually these landslides are several tens if not a few hundred acres in size but in most cases they are "nested" together and hence are referred to as complexes. Because of their size and depth (usually greater than 30 feet) the role of vegetation in helping stabilize these features is minimal except along the margins of the slide mass where the landslide depth diminishes to 10 feet or less. Slope movement activity for the large landslides ranges from relict (inactive to the point where large portions of the landslide have eroded away by surface erosion) to dormant young (last movement occurred within the last 100 years). Soil creep is ubiquitous across the forest because of the sandy texture of the weathered granitics and hillslope steepness.

Geomorphology and Ground Water

Across the forest there are large areas where the bedrock is uniform – for example the large areas of granititics on the eastern two-thirds of the forest and large areas of metamorphic rock found along the western third of the forest. Where rock is one type the common drainage pattern that results is dendritic (shaped like the veins in a maple leaf). However, the high shear strength of many of the rocks found on the forest (typically the uniaxial uncompressive shear strength is greater than 10,000 psi) results in surface water being forced to travel along fractures and joints leaving a strong rectangular overprint to the general dendritic pattern. This drainage pattern has a strong influence on where debris flows will travel and where the deposits will occur. It appears that the drainage patterns on the forest may influence the stability of large, deep-seated landslides.

The volcanic lava and mud flows found on ridge crests also have a strong influence on the ground water geometry within the upper slopes and hence the slope stability of these areas. The volcanic material usually acts as a water-bearing material (aquifer) and the underlying rock of the ancient canyon walls acts as a water-confining material (aquatard). This scenario is especially prevalent where the volcanic material of the Mehrten Formation overlies the Valley Springs Formation materials – a scenario where springs are common as well as landslides and debris flows initiated from the spring line areas.

Debris slides and debris flows are commonly associated with riparian zones where ground water is elevated. When debris slides are initiated they may travel a few feet downslope. Debris flows, however, usually travel hundreds to thousands of feet downstream. If there is enough water within the debris slide toes this part of the landslide may become a debris flow. As debris flows enter stream courses the moisture content increases so that they become debris torrents. Debris flows/torrents will travel downstream until one of two conditions occurs: the stream conveying the debris enters a channel (in plan view) at an angle more than 70°, or the stream gradient drops to approximately less than 3°. The numerous colluvial and alluvial fans and aprons found on most valley floors on the forest indicate that in the past debris flows/torrents have reached these areas under natural conditions.

Analysis Framework

Factors Contributing to Slope Stability

There is a greater possibility of hillslope instability when roads and trails meet a set of conditions. The two conditions that have the most influence of slope instability are 1) hillslopes with gradients greater than 57%; and, 2) presence of springs. The rationale for this is the application of limit equilibrium models across the forest which have resulted in output values showing that the angle of internal friction for a large majority of the soils lies within the range of 29° to 35° (57% is equal to 30°). From this work the observation was made that hillslopes that are steeper than 57% and are wet will likely pose stability problems.

Therefore a GIS exercise was completed to measure road or trail lengths that crossed hillslopes with the conditions of hillslope gradients 57% and steeper and presence of the Mehrten Formation overlying the Valley Springs Formation (where springs are commonly found). Additional information was also applied in finding susceptible slope stability problems. These include areas within the GIS that previously were identified as mass wasting areas with a moderate or high hazard rating, debris flow areas with moderate or high hazard rating, and inner gorge landform areas.

Table 3-B.1 below provides the results of the GIS geohazard analysis. The most common hazard identified in the GIS exercise was the mapped areas of moderate mass wasting hazard (i.e., Mwu_5). The number of miles of roads and trails within these mapped areas divided by the total area for each alternative ranged from a few tenths of a percent to approximately 5 percent (i.e., 4.90 percent). The next most common hazard was the mapped areas of high mass wasting hazard (i.e., Mwu_7). In this category the percentages ranged from a few tenths of a percent to approximately 3 percent (i.e., 2.92 percent). The other categories (e.g., slopes greater than 57%, inner gorge areas (IG), and the presence of the Mehrten Formation over the Valley Springs Formation (Tm/Tvs)) showed results that were less than 1% for all alternatives. In other words, all of the possible geologic hazards related to roads and trails on this forest comprise less that 5% of the proposed alternatives.

However, the simple presence of areas designated as high hazards could make slope stability an important effect to be evaluated in this EIS. A qualitative (non-numerical) analysis can be completed to assess the slope stability risk of the alternatives in the EIS and address the direct, indirect and cumulative effects. This was accomplished using the methodology suggested by Fell et al. (2005) and displayed in Table 3-B.2 below.

Risk in the geologic literature is defined as a combination of geologic hazard and consequences from the hazard if it occurs (e.g., Wu et al., 1996; Koler, 1998, Rollerson et al., 2000; Koler, 2000; Koler, 2004; Koler, 2005; Koler, 2006; Koler et al., 2007; and, Parson et al., 2007) . In a worst case scenario of roads and trails crossing mass wasting areas with a high hazard the descriptors in the table are “unlikely” to “possible.” Consequences range from “insignificant” to “medium” with a small possibility that a few areas will have “major” consequences. Using these criteria, the risk of geologic hazards for the alternatives range from very low to medium with a large majority of the risk results falling within the very low to low category. Therefore, geologic hazards will not present a major problem for the alternatives presented in this EIS. Results from this risk analysis are portrayed by alternatives in Table 3-B.3 below.

Data and Assumptions

For a discussion of the data and assumptions used in this analysis see the beginning pages of Chapter 3.

Environmental Consequences

Direct, Indirect and Cumulative Effects Common to All Alternatives

There are no direct, indirect, or cumulative effects from any of the alternatives because geologic hazards relative to roads and trails evaluated at this scale (1:24000) are not measurable. Geologic hazards will continue under normal conditions with or without the presence of roads and trails. Large landslide stability will be influenced by the ground water rise with little or no influence from road and trail management. The naturally occurring stream bank and riparian zone debris slides and flows will continue to shed sediment. The modification of road or trail prisms, as well as realignment of these corridors, has the potential to influence shallow landslides. However, even these are few, and the GIS analysis indicates an effect on less than 5% of the area for all alternatives, even under the worst-case conditions.

Table 3-B.1: Results from the GIS geohazard analysis

Alternatives	% Df5	Total %	% Df7	Total %	% Mwu5	Total %	% Mwu7	Total %	Tm/Tvs >57%	Total %	% IG	Total %	Slopes >57%	Total %
System Roads Geohazard														
A	6.32	0.63	0.82	.08	42.04	4.17	29.38	2.92	5.94	0.59	7.06	.70	8.45	0.84
B	5.71	0.53	0.96	.09	47.46	4.40	21.61	2.00	7.98	0.74	6.45	.60	9.83	0.91
C	5.74	0.58	0.98	.10	46.98	4.71	21.60	2.17	8.13	0.82	6.58	.66	9.99	1.00
D	5.44	0.53	1.09	.11	47.12	4.59	22.50	2.19	6.13	0.60	7.34	.71	10.38	1.01
E	5.14	0.54	1.13	.12	46.27	4.90	23.22	2.46	6.34	0.67	7.59	.80	10.31	1.09
System Trails Geohazard														
A	3.22	0.02	0.00	.00	56.59	0.31	8.03	0.04	0.96	0.01	19.79	.11	11.36	0.06
B	9.70	0.15	0.00	.00	62.00	0.94	3.75	0.06	1.25	0.02	15.16	.23	8.13	0.12
C	0.00	0.00	0.00	.00	84.20	0.85	5.09	0.05	1.18	0.01	0.18	.00	0.00	0.00
D	3.14	0.04	0.00	.00	71.34	0.84	4.79	0.06	1.10	0.01	9.30	.11	10.34	0.12
E	0.00	0.00	0.00	.00	56.11	0.57	4.83	0.05	1.42	0.01	24.29	.25	13.35	0.14
Non-system Roads Geohazard														
A	3.99	0.09	0.49	.01	52.65	1.15	22.78	0.50	6.26	0.14	7.66	.17	6.18	0.13
B	0.00	0.00	0.00	.00	18.90	0.01	7.87	0.01	22.05	0.02	39.37	.03	12.60	0.01
C	0.00	0.00	0.00	.00	31.33	0.01	12.42	0.01	0.00	0.00	36.43	.02	15.70	0.01
D	0.00	0.00	0.00	.00	31.33	0.02	12.42	0.01	0.00	0.00	36.43	.02	19.93	0.01
E	0.00	0.00	0.00	.00	31.33	0.02	12.42	0.01	0.00	0.00	36.43	.02	19.93	0.01
Non-system Trails Geohazard														
A	1.18	0.01	0.00	.00	70.03	0.39	16.55	0.09	6.68	0.04	2.53	.01	3.03	0.02
B	0.00	0.00	0.00	.00	88.14	0.11	2.54	0.00	0.00	0.00	0.00	.00	9.32	0.01
C	0.00	0.00	0.00	.00	95.49	0.08	4.51	0.00	0.00	0.00	0.00	.00	0.00	0.00
D	0.00	0.00	0.00	.00	81.94	0.08	3.87	0.00	0.00	0.00	0.00	.00	14.19	0.01
E	0.00	0.00	0.00	.00	85.81	0.09	4.05	0.00	0.00	0.00	0.00	.00	10.14	0.01

Table key: moderate hazard debris flows (Df_5), high hazard debris flows (Df_7), moderate hazard mass wasting units (Mwu_5), high hazard mass wasting units (Mwu_7), Tertiary Mehrten and Valley Springs Formations on slopes greater than 57% (Tm/Tvs >57%), inner gorge (IG), and slopes greater than 57% (slopes > 57%).

Table 3-B.2: Qualitative terminology for use in assessing risk to property (modified from Fell et al., 2005)

Qualitative measures of likelihood of landsliding		
Level	**Descriptor**	**Description**
A	Almost certain	The event is expected to occur
B	Likely	The event will probably occur under adverse conditions
C	Possible	The event could occur under adverse conditions
D	Unlikely	The event could occur under very adverse circumstances
E	Rare	The event is conceivable but only under exceptional circumstances
F	Not credible	The event is inconceivable or fanciful
Qualitative measures of consequences to property		
1	Catastrophic	Structure completely destroyed or large scale damage requiring major engineering works for stabilization
2	Major	Extensive damage to most of the structure, or extending beyond site boundaries requiring significant stabilization
3	Medium	Moderate damage to some of the structure, or significant part of the site requires large stabilization works
4	Minor	Limited damage to part of the structure, or part of the site requires some reinstatement/stabilization works
5	Insignificant	Little damage

Qualitative risk analysis matrix – classes of risk to property					
	Consequences to property				
Likelihood	**Catastrophic**	**Major**	**Medium**	**Minor**	**Insignificant**
Almost certain	VH	VH	H	H	H
Likely	VH	H	H	M	L-M
Possible	H	H	M	L-M	VL-L
Unlikely	M-H	M	L-M	VL-L	VL
Rare	M-L	L-M	VL-L	VL	VL
Not credible	VL	VL	VL	VL	VL

Legend – VH: very high risk; H: high risk; M: moderate risk; L: low risk; VL: very low risk

Table 3-B.3: Results from the GIS geologic risk assessment including direct, indirect and cumulative effects for each alternative

Alternatives	Df5	Df7	Mwu5	Mwu7	Tm/Tvs > 57%	IG	Slopes > 57%	Direct, Indirect and Cumulative Effects
System Roads Geologic Risk								
A	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
B	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
C	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
D	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
E	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
System Trails Geologic Risk								
A	VL to L	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
B	VL to L	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
C	VL to L	NA	VL to L	VL to M	VL to M	NA	NA	No measurable effects
D	VL to L	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
E	VL to L	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
Non-system Roads Geologic Risk								
A	VL to L	VL to M	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
B	NA	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
C	NA	NA	VL to L	VL to M	NA	VL to M	VL to M	No measurable effects
D	NA	NA	VL to L	VL to M	NA	VL to M	VL to M	No measurable effects
E	NA	NA	VL to L	VL to M	NA	VL to M	VL to M	No measurable effects
Non-system Trails Geohazard								
A	VL to L	NA	VL to L	VL to M	VL to M	VL to M	VL to M	No measurable effects
B	NA	NA	VL to L	VL to M	NA	NA	VL to M	No measurable effects
C	NA	NA	VL to L	VL to M	NA	NA	NA	No measurable effects
D	NA	NA	VL to L	VL to M	NA	NA	VL to M	No measurable effects
E	NA	NA	VL to L	VL to M	NA	NA	VL to M	No measurable effects

Key: NA = not applicable (no presence of a geologic hazard); VL = very low risk; L = low risk; M = moderate risk.

C. Soil Resources

Affected Environment

Soils of the ENF have been mapped and described in two reports of the National Cooperative Soil Survey: Soil Survey Eldorado National Forest, California (Mitchell and Silverman 1986), and Soil Survey of Eldorado Area, California (Rogers 1974). The general soil map in the report by

The motorized routes in this zone are primarily 4WD trails. The effects of public wheeled motor vehicle use on the soils in this zone are typically related to erosion of shallow soils, inadequate drainage, and vehicle use within wet meadows.

The affected environment for evaluating the effects of the alternatives on soil resources is limited to existing native surfaced roads and OHV trails within the Forest boundary (exclusive of Rock Creek) that are or have been used by motorized vehicles, including unauthorized routes. Surfaced roads are not included.

Analysis Framework

Introduction

No new construction or restoration is proposed under the alternatives. Therefore, the analysis for soils will focus on the treads of existing native surfaced roads and trails as identified in the description of Alternative A in Chapter 2. Native surfaced roads are more susceptible to soil loss than surfaced roads.

Native Surfaced Roads and Trails

Defining the characteristics of roads and trails in the project area is important for analyzing the effects of the alternatives. The analysis will focus on four types of roads and trails.

1. *System roads* (ML-1, ML-2) were originally constructed for hauling timber. These roads have a cutslope, a road prism, and a fillslope. System roads generally have well-compacted prisms, and constructed watercourse crossings with culverts and fills. Drainage is provided by inside ditches with culvert cross drains and by rolling dips. Long sustained gradients are common, but are usually not steep. Maintaining drainage structures is the key to minimizing erosion on system roads. Drainage structures are particularly susceptible to damage during the wet season by motorized vehicles.

2. *Designated OHV trails* were either constructed specifically for OHV use, or were converted from roads. Trails specifically designed for OHV use are narrow, have minimal cuts and fills, and have meandering alignments without long sustained gradients. Drainage is provided by rolling the grade and constructing OHV rolling dips. Except where constructed by hand, trails are cut into the subsoil and treads are compacted. Many OHV trails, however, were not originally designed and constructed for OHV use, but were converted from roads. Road prisms are well-compacted and provide a firm running surface, but the compacted surface makes installing OHV rolling dips difficult. The long sustained gradients of trails converted from roads demand more attention to drainage.

3. *Four-wheel-drive* roads have little cut and fill. Many 4WD roads were located on ridgelines to maintain a gentle gradient and to stay on shallow soils to avoid rutting. Drainage is typically provided by rolling the grade. Typical problems on 4WD roads include excessive tread wear on steep gradients, capture of sheet flow from sideslopes or ephemeral drainages, and crossing wet areas.

4. *Unauthorized routes* typically began as wheel tracks. They lack drainage structures, roll the grade only by chance, and may include unsustainably steep gradients. Because unauthorized routes were not constructed, treads are in loose topsoil rather than well-compacted subsoil. As topsoil is eroded, treads become entrenched, concentrating runoff and resulting in deeper erosion.

Soil Loss on Native Surfaced Roads and Trails

Concentrated runoff is the primary agent of erosion on native surfaced roads and trails and unauthorized routes. Mechanical displacement of soil by wheeled motor vehicle traffic is also important, although most mechanically displaced soil is ultimately transported by concentrated runoff. Mechanical displacement becomes more significant as route gradients become excessively steep. Mechanical erosion and soil loss by dusting are problems on unauthorized routes because treads in surface soils are high in organic matter and generally not well compacted.

There are three types of soil loss related to roads and trails. When a route was allocated to be part of the transportation system, the road prism or trail tread lost its capacity to grow vegetation. Although soil was not lost from the site, the soil was dedicated use as a transportation facility. Since no new road or trail construction is planned, this type of soil loss does not apply in this analysis. Unauthorized routes already exist, but were not planned with engineering design nor analyzed for loss of soil productivity.

The second type of soil loss is erosion of the road or trail tread. This is not a loss of productivity—that loss occurred when the tread was allocated for use as a road or trail. But tread erosion can reduce the capacity of the road to function as a transportation facility, so tread lost by erosion is a loss of facility function.

The third type of soil loss occurs when water concentrated on a road or trail leaves the route and creates a gully in adjacent soils. This is a loss in productivity, the capacity to grow vegetation, and a loss of hydrologic function.

There are other off-site impacts of soil loss, such as when sediment from erosion of roads and trails is delivered to a watercourse. For this analysis, sedimentation is not considered a soil impact. Sedimentation is covered in the Hydrology and Aquatic Resources Section of this Chapter as an impact on water quality.

Data

The soil analysis was based upon a comparison of seasonal closures during wet weather periods and the following information collected from the GIS database: soils susceptible to gully erosion, total miles of routes open by alternative, and condition of native surfaced roads based on field assessments. Since sustained, steep gradients are also an indicator of the risk of erosion, a query of routes with gradients of 15 percent or greater and 200 feet or more in length was attempted. It was unsuccessful due to limitations in the data base.

Assumptions

See the assumption section at the beginning of Chapter 3 for a general list of assumptions. The following list is specific to soil resources.

- The decision to allow or prohibit the use of public wheeled motor vehicle on routes would have no direct effects on soils. However, a route designation decision does have the potential to affect soils indirectly to the extent that it affects the concentration of use on roads and trails, the levels of maintenance needed, and the potential for damaged areas to recover. The magnitude of the indirect effects on soils will depend on (1) how effectively law enforcement can confine traffic to designated routes; (2) how effectively law enforcement can keep traffic off routes that are not designated; and (3) how well routes closed to public wheeled motor vehicle use recover on their own, without restoration treatments.

- To the extent that wheeled motor vehicle traffic is the primary cause of erosion, prohibiting public wheeled motor vehicle use of existing routes will result in less erosion. In most situations, however, erosion is the result of a combination of factors that include poor route design or location, lack of drainage, and inadequate maintenance.
- The routes being evaluated, as described in the description of Alternative A in Chapter 2, already exist. They are compacted and generally lack vegetation, and some are eroded. From the standpoint of soil productivity, these routes are already non-productive. Therefore, the potential effects on soils are only related to sustaining route function, protecting adjacent soils from runoff and gully erosion, or restoring the routes to a productive state. A more complete discussion of these factors can be found in the project record.
- Surfaced roads are not included in this analysis because soil loss by erosion on surfaced roads is very low.

Indicator Measures

To display the differences between the alternatives, with respect to effects to the soils resource, the following six indicator measures were used:

Indicator Measure 1: Miles of roads and trails open for public wheeled motor vehicle use susceptible to gully erosion.

Indicator Measure 2: The condition of NFS ML-1 and ML-2 roads open for public wheeled motor vehicle use, based on the condition evaluation database.

Indicator Measure 3: The total miles of routes open to public wheeled motor vehicle use.

Indicator Measure 4: Miles of ML-1 roads proposed for conversion to ML-2 roads.

Indicator Measure 5: Miles of unauthorized routes proposed for designation.

Indicator Measure 6: Protection of routes open to public wheeled motor vehicle use during wet weather periods.

Environmental Consequences

Direct Effects for All Alternatives

The decision to allow or prohibit the use of public wheeled motor vehicle on routes would have no direct effects on soils.

Indirect Effects for All Alternatives

Indicator Measure 1: This indicator addresses the risk of off-site impacts of roads and trails on soils. Table 3-C.1 shows miles of roads and trails on soils with a high potential for gully erosion. The two soil surveys covering the ENF (Rogers 1974, Mitchell and Silverman 1986) were used to identify soil mapping units with shallow soils and inclusions of rock outcrop. A GIS query was made for route segments on these soils that were also on slopes greater than 30 percent. These route segments tend to capture and concentrate runoff that can lead to gully erosion on adjacent slopes.

Table 3-C.1: Soils susceptible to gully erosion, by Alternative (miles)

Alternative	NFS Road	NFS Trail	4WD Trails	Unauthorized	TOTAL
A	44.0	10.7	0.2	9.7	64.6
B	29.7	7.5	0.2	1.5	38.9
Mod B	31.3	7.6	0.2	0.6	39.7
C	28.2	1.4	0.2	1.4	31.2
D	23.1	3.3	0.2	1.5	28.1
E	21.4	5.3	0.2	1.4	28.3

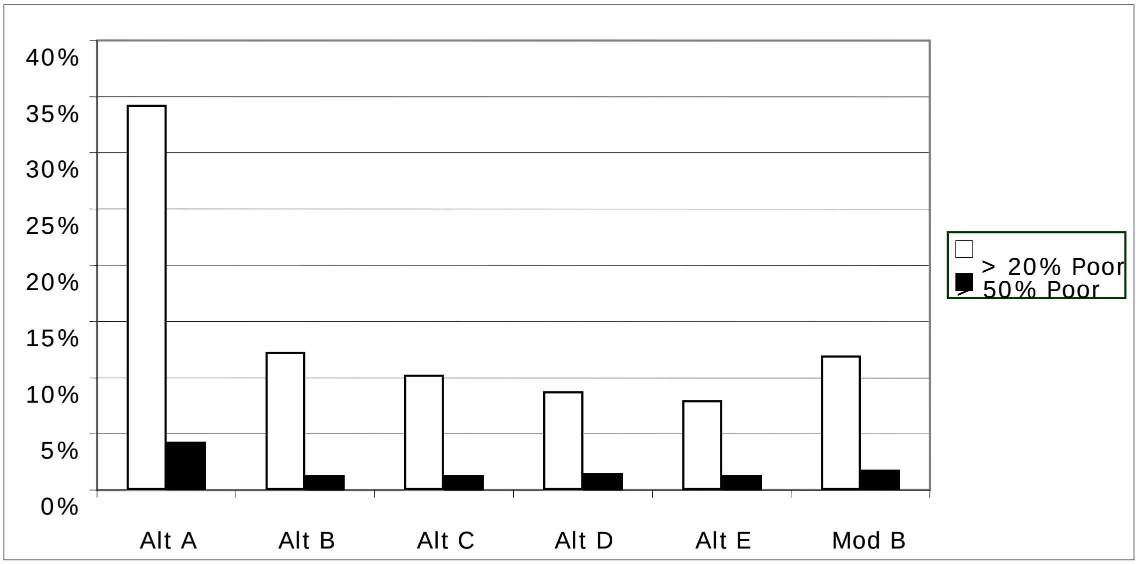
In terms of the percent of total miles of routes open for public motorized vehicle use (see Table 2-17 in Chapter 2), routes on susceptible soils in the action alternatives range from about 2.5 percent for Alternatives C and D to about 3.2 percent for Alternatives B, Modified B, and E. This is a small proportion of the routes open. Alternative A has the greatest number of miles open for public wheeled motor vehicle use on susceptible soils. The total length of roads and trails that would allow use on susceptible soils under Alternatives B and Modified B is about 60 percent of that open for use in Alternative A. Alternatives C, D, and E are roughly the same, and allow use on only 44 to 48 percent of the number of miles on susceptible soils as occur in Alternative A. This means Alternatives A, Modified B, and B would have a slightly higher risk of gully erosion on soils adjacent to open routes. Therefore, Alternatives A, Modified B, and B would require higher levels of maintenance to protect soils from gully erosion.

Indicator Measure 2: Table 3-C.2 shows the number of NFS ML-1 and ML-2 roads open for public wheeled motor vehicle use by condition and alternative. Field surveys were conducted on 400 NFS ML-1 and ML-2 roads. Road condition was recorded as the percent of each route that was rutted, washed out, eroded, or slumped; had poor drainage; or was too steep. These indicators of poor condition are summarized into two groups: (1) number of routes where more than 20 percent of the route was in one or more of the poor condition classes, and (2) number of routes where more than 50 percent of the route was in one or more of the poor condition classes. Figure 3-1 displays the same data in terms of percent of the NFS ML-1 and ML-2 roads currently open for public wheeled motor vehicle use in Alternative A.

Table 3-C.2: Number of open NFS ML-1 and ML-2 roads by condition and Alternative

Alternative	A	B	Mod B	C	D	E
> 20 percent in poor condition	137	49	48	41	35	32
> 50 percent in poor condition	17	5	7	5	6	5

Figure 3-C.1: Percent ML-1 and ML-2 Roads in poor condition by Alternative



The number of NFS ML-1 and ML-2 roads in poor condition is roughly the same for Alternatives B, Modified B, C, D, and E, but is about three times higher under Alternative A. If Alternative A were implemented, an increase in maintenance would be needed to control erosion. If Alternatives B, Modified B, C, D, or E were implemented, there would be a backlog of degraded NFS ML-1 and ML-2 roads not open for public wheeled motor vehicle use in need of decommissioning, restoration, or at least minimal maintenance to provide drainage to control runoff water and prevent erosion.

Road condition also indicates how well each alternative avoids problem areas. Not designating routes in poor condition would remove from the system routes that require high maintenance. This would allow more effective use of limited maintenance resources. However, the condition surveys did not specifically address causes, so some poor condition ratings could be due to a lack of maintenance, and not necessarily due to poor location.

Indicator Measure 3: Table 2-17 (Chapter 2) shows the total miles of native surfaced roads and trails open for pubic wheeled motor vehicle use in each alternative. Compared to Alternative A, Alternatives B, Modified B, and C would have about 40-42% as many miles open as Alternative A; Alternative D would have about 36%; and Alternative E about 32%. The small differences between some alternatives, for example between B and C, would not result in measurable effects on soils. But the differences between the alternatives with greater differences, for example between Alternatives B and E, might have measurable effects.

The decrease in routes open for public wheeled motor vehicle use may concentrate use. This increases tread wear on the routes that remain open, and more maintenance would be needed on open routes. However, with fewer routes to maintain, the level of maintenance of remaining routes may also increase. This increase in maintenance somewhat neutralizes the effects of concentrated use. As opportunities for motorized recreation decrease under Alternatives B, Modified B, C, D, and E, there may be increased pressure to create unauthorized routes. The effect on soils would depend on the effectiveness of law enforcement and on the diversion of use to other places.

Indicator Measure 4: Table 2-19 (Chapter 2) shows miles of ML-1 roads proposed for conversion to ML-2 roads. ML-1 roads are inspected infrequently and rarely maintained. Although closed to public use, ML-1 roads create opportunities for unauthorized use. ML-2 roads get more use than ML-1 roads, but they have a greater possibility for maintenance. Conversion of ML-1 to ML-2 roads would also contribute to dispersion of use. On balance, and assuming the seasonal closure is effectively implemented (see *Indicator Measure 6*), converting ML-1 roads to ML-2 would provide slightly more protection of the soil resource. The most conversion would occur under Alternatives B, C, and Modified B (24%, 20%, and 17% converted); Alternative D a little less (12%); and almost none (0.5%) under Alternative E. No conversion would occur under Alternative A.

Indicator Measure 5: Table 2-19 (Chapter 2) shows miles of unauthorized routes proposed to be open. Unauthorized routes that are designated for use are more likely to receive drainage and maintenance than those not designated. If unauthorized routes are merely closed to public use but not drained or restored they may continue to erode, although some would gradually recover with effective closure. Under the action alternatives only about 3% to 9% of the 526 miles of unauthorized routes would be designated, so the effects of this indicator on the soil resource would be similar for all action alternatives.

Indicator Measure 6: Table 2-20 (Chapter 2) shows wet weather closures by alternative. Alternative A has no seasonal closure. Alternatives B, Modified B, and E would close native surfaced roads and trails from January 1 to March 31; Alternative D from December 1 to April 30; and Alternative C from November 1 to April 30. If weather and soil conditions are suitable for use, roads and trails could be designated open during November, December, and April under Alternative C, and during December and April under Alternative D. In addition to these seasonal closures, under the action alternatives roads and trails could be closed by forest order whenever there was a risk of causing resource damage.

Wet season closure is an enforcement tool of major importance in protecting roads and trails from soil damage. When wet, native surfaced roads and trails have low soil strength and are therefore susceptible to rutting and soil damage. Rutting damages treads, concentrates runoff that can lead to gully erosion, and leads to trail widening. Native surface drainage structures such as rolling dips, waterbars, and other waterbreaks can also be damaged. Closing roads and trails when soils are wet reduces the risk of soil damage. A more detailed discussion of the rationale for seasonal closure is in Chapter 2 and in Appendix D.

At the end of each wet season closure, roads and trails would be open for use. However, if soil and weather conditions were unsuitable, the closure could be extended by forest order. Under Alternatives B, Modified B, and E, native surfaced roads and trails would be *opened* for use on April 1, unless soil and weather conditions justified an extension. However, under Alternatives C and D, roads and trails would *remain closed* unless soil and weather conditions justified opening them for use. Therefore, during the month of April, the risk of soil damage would be slightly less under Alternatives C and D than under Alternatives B, Modified B, and E.

At the beginning of the rainy season, under Alternatives B, Modified B, and E, roads and trails would be *open* during December, unless soil and weather conditions justified a closure. Under Alternatives C and D, roads and trails would be *closed* unless conditions justified opening them. This would also be the case for Alternative C in November. As in the spring, the differences among the alternatives are dependent on the differences between *open unless closure is justified* and *closed unless opening is justified*. Since it would take several days or more to evaluate soil and weather conditions justify closing (or opening) roads and trails, plus time to prepare a forest order and notifications, the alternatives with the most time in the *closed unless justified open* status would provide the most protection of soils from damage during the wet season.

Based on time in the *closed unless opened* status, the effects of wet season closures on soils would be:

Alternative C – Provides the most protection from soil damage by wet season use.
Alternative D – Provides slightly less protection than Alternative C.
Alternatives B, Mod B, E – Provides less protection from soil damage during the wet season.
Alternative A – Has a high risk of soil damage from vehicle use during the wet season.

Cumulative Effects

Geographic Scale

The geographic scope of the cumulative effects analysis selected is the entire ENF, since the routes allowing public wheeled motor vehicle use occur within this area and the effects are likely to occur within this area.

Analysis

The cumulative effects analysis for the soils resource considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: road and trail maintenance; closure or restoration of routes not open for use and not maintained for administrative use or other uses, fuels treatments, urban interface growth and increased use, and future road or trail realignment, reconstruction, or decommissioning.

Management actions affect traffic, creation of unauthorized routes, maintenance, the effectiveness of closures, and recovery of closed routes. Cumulatively, these actions influence tread wear and soil erosion.

The wet season closure, which applies to the action Alternatives (B, Modified B, C, D, and E) would be an important management tool in regulating use during the rainy season. Regulating use during the rainy season would have a major effect on reducing rutting and erosion.

The current poor condition of many roads and trails shows that maintenance has been inadequate in the past. The reduction in timber harvest has had a major effect on road condition, especially NFS ML-2 roads. These roads received regular maintenance when they were used as timber haul roads. When there was logging activity, NFS ML-2 roads were also closed during the wet season. With the reduction of the timber program there has also been a decline in Forest Service road maintenance. The lack of maintenance has allowed drainage structures to deteriorate, putting many NFS ML-2 roads at a high risk of failure under a major storm event. The cumulative effect of these actions has been erosion and deterioration of roads and an increased risk of failure.

Fuels treatments open up stands, create fire lines and temporary roads, and generally create opportunities for unauthorized OHV use. This has been and will continue to be a problem in urban-interface areas, along the heavily used Highway 50 corridor, and in other areas with easy access to the Forest.

The Forest-urban interface in the foothills is one of the most rapidly growing areas in the State, and OHV registrations in this area are increasing at an even faster rate (Widell 2002). Demand for motorized recreation, especially on all-terrain vehicles (ATVs) is increasing. This demand will increase use levels on open routes, resulting in more tread wear, wear on drainage structures, and the potential for increased erosion.

Following this travel management decision there may be a need for reroutes or restoration of roads and trails. Reroutes would require some new construction that would cause soil disturbance and a temporary loss of vegetation. Restoration of damaged areas and road decommissioning would also cause soil disturbance. If these actions are implemented in the future, the long-term effects of these actions would be to reduce soil erosion. These projects will require further environmental analysis at the time that the specific projects are proposed.

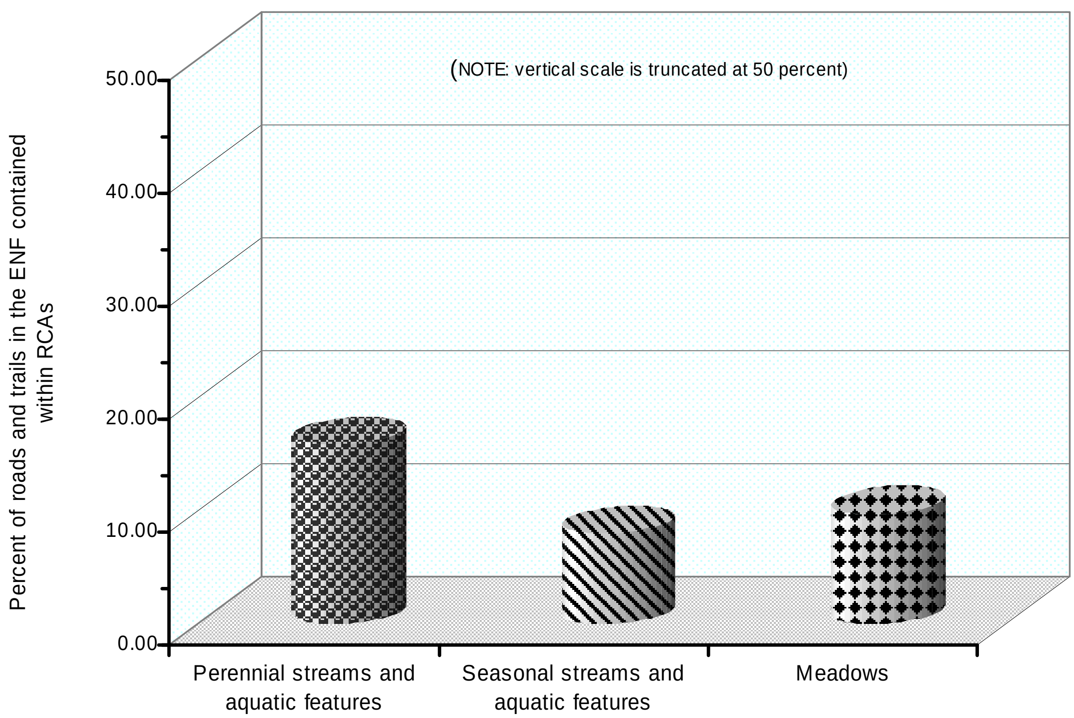
D. Hydrology and Aquatic Resources

Affected Environment

The Eldorado National Forest (ENF) includes approximately 1,745 square miles of the Sierra Nevada Mountains in northern California. The ENF contains portions of four major drainage basins: the North Fork American River, the South Fork American River, the Cosumnes River, and the Mokelumne River. These four drainage basins include 155 watersheds (7th field or HUC 7 watersheds[1]) and approximately 1,248 miles of perennial streams. The hydrologic characteristics of the ENF and its aquatic features are summarized in Table 3-8.

The ENF contains more than 3,000 miles of roads and trails, a large portion of which are not paved. A small portion of the unpaved roads and trails are unauthorized routes. Approximately 13.5 percent of the roads are located within the Riparian Conservation Areas (RCAs) of perennial streams and lakes (Figure 3-3).[2]

Figure 3-D.1: Percent of roads and trails in the Eldorado National Forest (ENF) that are contained in the Riparian Conservation Areas (RCAs) of aquatic features



[1] HUC = Hydrologic Unit Code. HUC is the national system for classifying watersheds. The largest scale watersheds are HUC 1 (1st field). The HUC 7 watersheds (7th field) in the ENF are mostly between 2,000 and 15,000 acres.

[2] The Riparian Conservation Area (RCA) is 300 feet on each side of perennial streams, 150 feet on each side of seasonal streams, and 300 feet surrounding special aquatic features (lakes, ponds, meadows, springs, bogs, and other wet areas). The RCAs are designated in the Sierra Nevada Forest Plan Amendment (SNFPA 2004).

Table 3-D.1; Hydrologic characteristics of the Eldorado National Forest (ENF)

Location	▪ Sierra Nevada Mountains in northern California. ▪ Western edge of the ENF is east of Sacramento. ▪ Eastern edge of the ENF is just southeast of Lake Tahoe.
Elevation	▪ Approximately 2,000 feet in the western edge of the ENF. ▪ Approximately 10,000 feet in the southeast edge of the ENF.
Climate	▪ Most of the precipitation occurs between November and April. ▪ Above 5,000 feet, precipitation is dominated by snow that equates to roughly 50 to 60 inches of water per year. ▪ Below 4,000 feet, precipitation is dominated by approx. 40 to 50 inches of rain/year.
Aquatic features	▪ 1,248 miles of perennial streams and 842 miles of seasonal (intermittent) streams. ▪ 1,108 lakes, which range from less than 1 acre to more than 2,740 acres in size. ▪ 1,857 meadows, which total 10,416 acres with an average size of 5.6 acres.
Major drainage basins/rivers	▪ The North Fork American River and the South Fork American River, which both flow to the west and into the Sacramento River. (HUC 4 watersheds)1. ▪ The Cosumnes River and the Mokelumne River, which both flow to the west and into the San Joaquin River. (HUC 4 watersheds).1
Watersheds[1]	▪ 4 th field watersheds (HUC 4): 7. Average size of 398,360 acres (622 square miles). ▪ 5th field watersheds (HUC 5): 28. Average size of 95,975 acres (150 square miles). ▪ 6th field watersheds (HUC 6): 88. Average size of 29,070 acres (45 square miles). ▪ 7th field watersheds (HUC 7): 155. Average size of 7204 acres (11.3 square miles); 95% of the 7th field watersheds are between 2,000 and 15,000 acres.
Beneficial uses of water[2]	▪ Municipal water supplies for domestic use; hydropower generation; contact and non-contact recreation; canoeing and rafting; cold freshwater habitat; spawning habitat; and wildlife habitat.
Condition of aquatic features	▪ The majority of aquatic features in the ENF have not been surveyed in the past 10 years for overall condition and ecological health. ▪ Results from a small number of aquatic features from 2004 to 2007 showed that 60% of the surveyed stream reaches were receiving excessive amounts of sediment and 90% of the meadows were functioning-at-risk or non-functional.3 ▪ Two rivers do not meet State water quality standards and are on the 303(d) list: Cosumnes River (for exotic species), and the South Fork American River below Slab Creek reservoir (for mercury).4
Roads	▪ More than 3,000 miles of roads and trails, a large portion of which are not paved. ▪ A small portion of the unpaved roads are not system roads - they are created by recreational use.
Existing road density in 7th field watersheds[5]	▪ 36% of the 7th field watersheds have a low road density of less than 2.5 miles of road per square mile of land (mi./mi.2). ▪ 42% of the watersheds have moderate road density of 2.6 - 5.0 mi./mi.2 ▪ 22% of the watersheds have a high road density of greater than 5.0 mi./mi.2
Existing road density near perennial streams in 7th field watersheds[5]	▪ 73% of the watersheds have a low road density of less than 1.5 miles or road per square mile of land (mi./mi.2). ▪ 22% of the watersheds have moderate road density of 1.6 - 3.0 mi./mi.2 ▪ 10% of the watersheds have a high road density of greater than 3.1 mi./mi.2

[1] HUC = Hydrologic Unit Code. HUC is the national system for classifying watersheds. The largest scale watersheds are HUC 1 (1st field). The ENF is part of the HUC 1 watershed that drains into the Pacific Ocean. The ENF includes portions of the HUC 2 and HUC 3 watersheds (2nd and 3rd fields) - the Sacramento and San Joaquin Rivers.

[2] Beneficial uses of water are designated by the Central Valley Regional Water Quality Control Board (CVRWQCB).

[3] These survey results were conducted in areas of cattle grazing and timber harvest. As a result, these survey results may NOT be indicative of the condition of aquatic features in the ENF as a whole.
[4] Section 303(d) of the Clean Water Act of 1972 requires each state to identify water bodies that fail to meet applicable water quality standards (CVRWQCB 2006).
[5] A detailed analysis of road density for watersheds in the ENF is contained in the Project File.

Analysis framework

The area of analysis includes all of the aquatic features contained within the Eldorado National Forest (ENF), with the exception of the area that includes the Rock Creek Trail System. The analysis is largely based on three sources of information:

- Attributes contained in GIS concerning the relationships between aquatic features and roads.
- Recent field surveys of the condition of aquatic features and roads in the ENF.
- Personal knowledge of aquatic features and roads by resource specialists in the ENF.

Numerous researchers have established that roads are a major source of sediment delivered to streams in otherwise relatively undisturbed watersheds, such as forests and rangelands. In addition, research has concluded that sediment from roads can result in adverse effects to streams and aquatic habitat (MacDonald and Stednick 2003; Gucinski and others 2001; Dissmeyer 2000; Meahan 1991). In the ENF, roads have resulted in adverse effects to the aquatic habitat of a number of streams. These streams include Alder Creek and several of its tributaries (Figure 3-4), Van Horn Creek, and several tributaries of Sopiago Creek (Markman 2003, 2007).

The published research has not established consistent numerical criteria for determining when roads are likely to contribute sediment to streams and other aquatic features such that the aquatic habitat of those features is adversely affected. Direct, quantitative, cause-and-effect links between roads and the condition of aquatic habitat and species have been difficult to document (Gucinski and others 2001). The relevant research on this topic is summarized in the Project File.

As a result of the limitations described above, the analysis of the alternatives in this section is a ***relative risk assessment*** of the likelihood of adverse effects to the condition of aquatic features in the ENF. This was accomplished using five Indicator Measures, two of which are numerical. These Indicator Measures identified perennial and seasonal streams where aquatic habitat will be at a ***high risk*** of being adversely affected as a result of sediment from unpaved roads and trails. The Indicator Measures are described in Table 3-9.

The assumptions that are specific to this analysis are described in Table 3-10. Most of the assumptions are supported by published research and/or personal experience of resource specialists in the Eldorado National Forest.

Table 3-D.2: Indicator Measures for evaluating effects to aquatic features and aquatic habitat as a result of sediment from unpaved roads and trails (routes).[1,2]

	Description of Indicator Measure	Criteria for Indicator Measure	Usefulness of Indicator Measure	Geographic scales for each Indicator Measure
Indicator Measure #1	Number and miles of streams (and stream segments) at a high risk of adverse effects to aquatic habitat as a result of routes.	More than one-third of the length of the stream (or stream segment) is bordered by routes that are less than 200 feet from the stream ***and/or*** two or more route crossings of the stream per linear mile of the stream.	Identifies specific streams and stream segments that are at a high risk of adverse effects to aquatic habitat from unpaved roads and trails.	Eldorado National Forest (ENF). Each of the four drainage basins in the ENF.[3] Individual stream systems.
Indicator Measure #2	Routes through meadows.	Miles of routes through meadows.	A route through a meadow frequently results in adverse hydrologic effects to a meadow.	Eldorado National Forest (ENF).
Indicator Measure #3	Compliance with Riparian Conservation Objectives (RCOs).[4]	Mostly a qualitative evaluation with respect to compliance with the RCOs.	Evaluation of the effects to water quality and beneficial uses of water.	
Indicator Measure #4	Protection of aquatic features from motor vehicle use during periods of wet weather.	Time period(s) of the closure of routes to vehicle use during periods of wet weather.	General relative indicator of the risk of vehicle use adversely affecting aquatic features and habitat.	
Indicator Measure #5	Protection of aquatic features from the creation of new routes near streams.	No numerical criteria. Presence or absence of restrictions to cross-country motorized vehicle travel.		

[1] The Indicator Measures were selectively chosen so as to include only those that were the most relevant. Examples: a) paved roads were not included because this EIS does not make decisions on the use of paved roads, b) roads and trails on private land contained within the ENF were not included because this EIS does not make decisions concerning the use of roads on private land.

[2] The Indicator Measures apply to ALL known unpaved roads and trails (routes), regardless of whether those routes are system roads, non-system roads, authorized routes, or unauthorized routes.

[3] The drainage basins are: North Fork American River, South Fork American River, Cosumnes River, and Mokelumne River.

[4] The Riparian Conservation Objectives are contained in the Sierra Nevada Forest Plan Amendment of 2004.

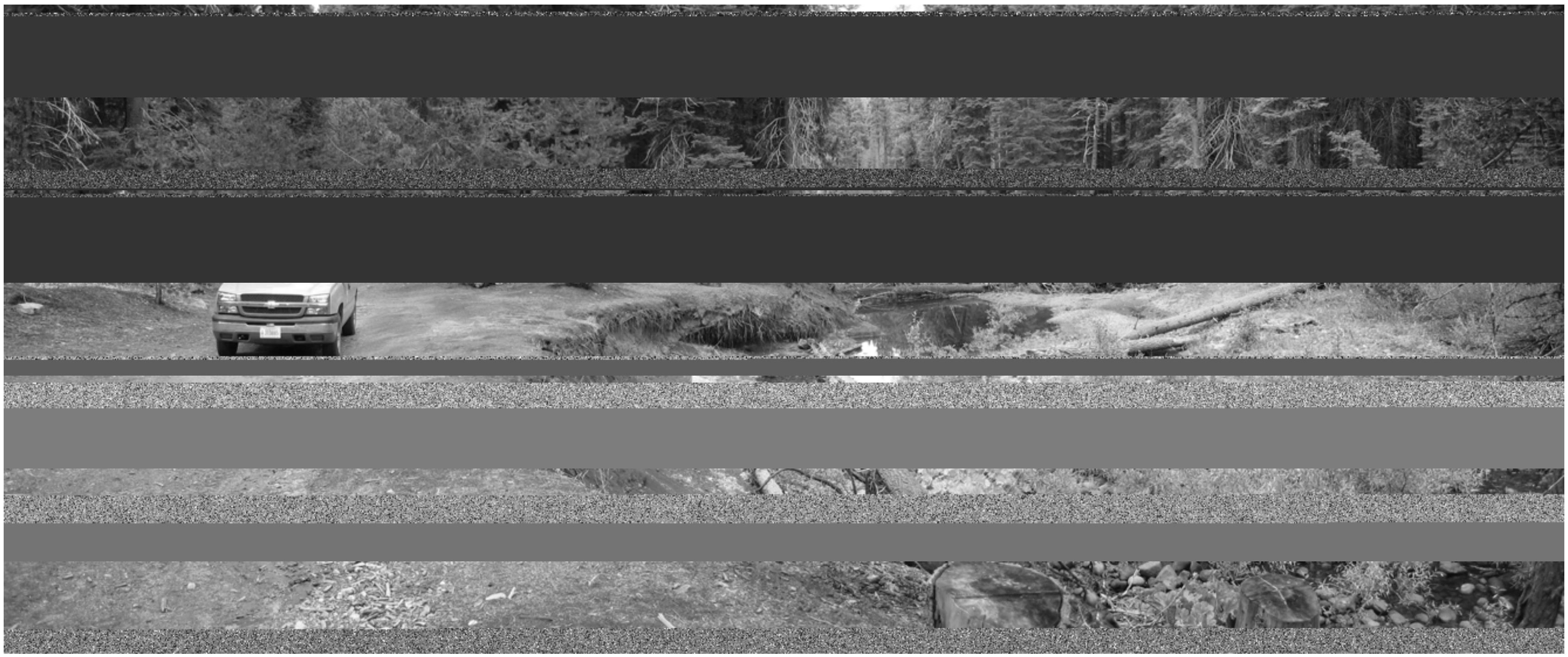
Table 3-D.3: Assumptions used in the analysis of the effects to roads to aquatic features and aquatic habitat in the Eldorado National Forest

1	Sediment is the major pollutant from native-surface roads. Most other pollutants from roads, such as trace metals and man-made chemicals, are attached to sediment (Gucinski and others 2001; Dissmeyer 2000). As a result, the relative effects of the alternatives with regard to sediment and aquatic habitat apply to trace metals and man-made chemicals.
2	The effects of roads on the peak flows of streams and the subsequent conditions of aquatic habitat are minor. Research on small watersheds typically has shown that peak flows do not increase until more than 12 percent of a watershed is covered with roads and other impermeable areas (Ziemer 1981). In the ENF, roads and impervious areas cover less than 12 percent of all of the 7th field watersheds with one exception: approximately 13 percent of the Iowa Canyon watershed is covered with impermeable areas as a result of residential development on private lands in the vicinity of Pollock Pines. (Impermeable areas include roads, landings, parking lots, and buildings. Impermeable areas usually do not include timber harvest areas and agricultural areas.)
3	A stream with adverse effects to aquatic habitat as a result of sediment from unpaved roads and trails (or other causes) generally shows one or more of the following characteristics: pools have been partially or completely filled-in with sediment, an excessive amount of fine-grained material occurs throughout much of the channel, the channel is wide and shallow, recent erosion of the channel is excessive, the streambanks are unstable.
4	For a small stream in mountainous terrain, the most important factors that influence the risk of adverse effects to aquatic habitat from unpaved roads are related to the length of unpaved roads near a stream, the distance of the unpaved roads from a stream, and the number of times that unpaved roads cross the stream. Other factors - such as the type of road use (cars, trucks, motorcycles, all-terrain vehicles, etc.) and the amount of road use on top of snow are usually less important factors. This is based on field observations over the past 16 years in several National Forests in the western United States (Markman, personal communication 2007), and is supported by relevant research as described in the Project Record.
5	The reduction or elimination of vehicle traffic on a road or trail near a stream will result in less sediment delivered from the road to the stream, and this in turn will reduce the risk of adverse effects to aquatic habitat from roads. This is because the reduction or elimination of vehicle traffic on a road, over a period of time, should reduce the amount of loose material on the road surface and also increase the amount of leaf litter and other cover on the road surface. As result, the amount of material that is readily available to erode from the road to a nearby stream should be reduced. The available research has shown that the erosion rates from a closed road will often decrease to near background levels as the density of vegetation on the surface of the road increases (Dissmeyer 2000).
6	The elimination of vehicle traffic on a road or trail near a stream during periods of wet road conditions will result in less sediment delivered from the road to the stream. Vehicle use on wet roads tends to cause ruts and damage to the roads, which tends to increase erosion of sediment from the road during rainfall events and periods of snowmelt (Markman, per. comm. 2007).
7	A road or trail through a meadow frequently results in adverse hydrologic effects to a meadow. Such effects usually include one or more of the following characteristics: disruption of surface flow patterns, disruption of the movement of ground water, delivery of sediment into the meadow, rills and gullies (USDA 1996; Markman, per. comm. 2007).
8	Ephemeral streams were not included in this analysis for three reasons. The results would have been erroneous. A large number of the streams in the GIS layer that are shown as ephemeral streams are not actually ephemeral streams on the ground - they are draws, swales, or upland areas. This means that hundreds of ephemeral streams that do not exist would have been shown as being at high risk of adverse effects to aquatic habitat (Markman, per. comm. 2007). Ephemeral streams generally do not contain aquatic habitat that is considered necessary for the survival and reproduction of threatened, endangered, and sensitive (TES) species. The risk of adverse effects to the aquatic habitat of perennial and seasonal streams - not including ephemeral streams - is adequate to characterize relative differences between the alternatives.

9	The density of roads and trails at the watershed scale will not be substantially changed as a result of any of the action alternatives (Alternatives B, Modified B, C, D, and E) for at least the next 20 years. The primary reason for this assumption is that action alternatives involve the closure of routes to vehicle use by the public and not the physical removal of roads. The removal of roads typically involves the excavation of culverts, the ripping of the road surface, and, in some cases, the re-contouring of the ground surface to blend in with the natural topography. Based on field observations in several National Forests in the western United States, it typically takes at least 20 years for closed roads to re-vegetate naturally (Markman, per. comm. 2007). The Implementation Strategy does allow for the restoration or rehabilitation of roads in the future; this means that slight changes in the density of roads at the watershed scale are possible in the future.
10	Direct and indirect effects are both short-term (less than 5 years after implementation) and long-term (more than 5 years after implementation), unless specifically described otherwise. Cumulative watershed effects are greater than 20 years in the future.
11	The alternatives differ in terms of the miles of routes open to public motor vehicle travel; there is no difference in the number of miles of routes that currently exist.
12	The term routes apply to all unpaved roads and trails, unless specified otherwise.

Several non-system roads parallel Alder Creek and contribute sediment directly into the floodplain of the stream (Figure 3-D.2). As a result, the aquatic habitat of Alder Creek has been adversely affected - pools have been filled in with sediment, the channel is wide with shallow water depths at a number of locations, and the water temperature exceeds 70 degrees Fahrenheit at times during the summer. At this location, the stream is also undercutting a road. *May 2006*.

Figure 3-D.2: Non-system roads parallel to Alder Creek



Environmental Consequences

Direct and Indirect Effects

Indicator Measure 1. Alternative A (no action) would result in the greatest number and miles of streams at a high risk of adverse effects to aquatic habitat from unpaved roads and trails (routes). All of the action alternatives (Alternatives B, Modified B, C, D, and E) would result in a reduction in the number and miles of streams at a high risk of adverse effects to aquatic habitat from routes; Alternative E would result in the greatest reduction. In addition, all of the action alternatives would either reduce or eliminate the miles of streams at a high risk of adverse effects from unauthorized routes (NSA and NSR routes). These results apply to the three geographic scales analyzed; however, the results are more pronounced as the size of the scale shrinks from the entire National Forest to specific stream systems. The results from Indicator Measure 1 are described in more detail in Tables 3-12 and 3-13 and shown graphically in Figures 3-5 through 3-11 (excluding Figure 3-9). It should be noted that a) most of the streams at a high risk of adverse effects to aquatic habitat from routes were identified by the length of stream bordered by routes - the number of route crossings of a stream identified only a few additional streams at high risk, and b) Indicator Measure 1 identified the streams where the aquatic habitat is <u>known</u> to be adversely affected from nearby unpaved roads (through field surveys or personal knowledge) - these include Alder Creek and several of its tributaries, Van Horn Creek, and several tributaries of Sopiago Creek (Markman 2003, 2007).

Indicator Measure 2. Alternative A would result in the largest number of miles of designated routes through meadows - there would be no reduction in the miles of routes through meadows from existing conditions. All of the action alternatives (Alternatives B, Modified B, C, D, and E) would result in a reduction in the number of miles through meadows. Alternative E would result in the greatest reduction, followed by Modified B. The results from Indicator Measure 2 are described in Table 3-12 and illustrated in Figure 3-9. An evaluation of the specific routes through meadows is contained in the Project File.

Indicator Measure 3. Alternative A does <u>not</u> benefit water quality and protect beneficial uses of water. As a result, Alternative A would <u>not</u> meet the Riparian Conservation Objectives (RCOs) contained in the Sierra Nevada Forest Plan Amendment (SNFPA) of 2004. All of the action alternatives (Alternatives B, Modified B, C, D, and E) should benefit water quality and protect beneficial uses of water to some degree. Alternatives E and Modified B would provide a greater benefit to water quality than the other action alternatives, and are expected to meet all of the Riparian Conservation Objectives and associated Standards and Guidelines contained in the SNFPA. Alternatives B, C, and D would likely not meet all of the RCOs. The reasons for the above conclusions are discussed in detail in the *Riparian Conservation Objective Analysis,* which compares all of the alternatives in terms of their consistency with each Riparian Conservation Objective is located in the project record.

Indicator Measure 4. For the streams identified by Indicator Measure 1 as being at high risk of adverse effects to aquatic features from routes, the amount of sediment delivered to those streams should be less under all action alternatives (Alternatives B, Modified B, C, D, and E) than Alternative A (no action). This is because Alternative A contains no restrictions on vehicle use on routes during periods of wet weather, and all of the action alternatives contain such restrictions. In terms of the action alternatives, Alternative C may provide a slightly greater reduction in the amount of sediment delivered to the streams identified at high risk than the other action alternatives. This is because the longer period of seasonal closure under Alternative C may include periods of wet weather that the other action alternatives do not. The rationale and benefits of wet season road closures is described in the section *Soils Resources* and Appendix D.

Indicator Measure 5. Alternative A (no action) does not benefit water quality, aquatic features, and aquatic habitat. This is because Alternative A would allow motorized vehicles to create new routes near aquatic features; the adverse effects of routes near aquatic features have been previously discussed in detail under the *Analysis Framework*. All of the action alternatives (Alternatives B, Modified B, C, D, and E) should benefit water quality, aquatic features, and aquatic habitat. This is because the creation of new routes near aquatic features should be dramatically reduced as a result of the restriction of motorized vehicle use to designated routes and the prohibition of cross-country vehicle travel. It is not possible at this time to identify and provide detailed analysis of specific aquatic features that would be affected by Alternative A (no action) because the location and number of future routes that might be created near aquatic features cannot be known. The effects to specific aquatic features as a result of the action alternatives are described under Indicator Measure 1.

Table 3-D.4: Summary of direct/indirect effects to aquatic resources by Alternative and Indicator Measure

Indicator Measure	Description of Indicator Measure	Alternative A (no action)	Alternatives B, Modified B, C, D, and E
1	Number and miles of streams at a high risk of adverse effects to aquatic habitat as a result of unpaved roads and trails (routes).	No reduction in the number and miles of streams at high risk of adverse effects to aquatic habitat from routes.	Reduction in the number and miles of streams at a high risk of adverse effects to aquatic habitat from routes (when compared to Alternative A); this includes unauthorized routes. Greatest reduction under Alternative E, followed by Modified B.
2	Routes through meadows.	No reduction in the miles of designated routes through meadows.	Reduction in the number of miles of routes through meadows. Greatest reduction under Alternative E, followed by Modified B.
3	Compliance with Riparian Conservation Objectives (RCOs).	Does not benefit water quality, ensure that beneficial uses of water are protected, and meet the RCOs.	Should benefit water quality and ensure that beneficial uses of water are protected. Alt. E provides the greatest benefit, followed by Modified B. Alternatives E and Modified B meet all of the RCOs. Alternatives B, C, and D do not meet all of the RCOs.
4	Protection of aquatic features from motor vehicle use during periods of wet weather.	No protection of aquatic features.	Seasonal road closures provide protection of aquatic features.
5	Protection of aquatic features from the creation of new routes near streams.	No protection of aquatic features.	Prohibition of cross-country motorized vehicle travel reduces the creation of new routes near aquatic features.

Table 3-12. Risk of adverse effects to aquatic habitat from unpaved roads and trails (routes) using Indicator Measures 1 and 2.

GEOGRAPHIC SCALE		
Eldorado National Forest	**Drainage basin[1]**	**Stream system**
Alternative A (no action) No reduction in the number and miles of streams at a high risk of adverse effects to aquatic habitat from unpaved roads and trails (routes); this includes unauthorized routes (NSA and NSR routes).[2]		
All alternatives At a forest-wide scale, 10.6 percent of the miles of perennial and seasonal streams would be at a high risk of adverse effects to aquatic habitat from routes. Alternatives B, Modified B, C, D, and E At a forest-wide scale, the percent of streams at high risk of adverse effects to aquatic habitat ranges from 4.1% (Alt. E) to 6.9% (Alt. B). When compared to Alternative A (no action), the reduction in the number and miles of streams at high risk ranges from 39% (Alt. C) to 65% (Alt. E). Reduction in the miles of streams at high risk from unauthorized routes (NSA and NSR routes).[2] Reduction in the miles of designated routes through meadows ranges from 45% (Alternative B) to 100% (Alternative E).	Alternatives B, Modified B, C, D, E Fewer miles of streams at high risk than Alternative A (no action) for the four drainage basins of the ENF. Most of the decrease in the miles at high risk would occur in the SFAR (105 miles to less than 40 miles) and COS drainage basins (85 miles to less than 60 miles). The primary reason for this is that over 87% of the stream miles at high risk are in these two drainage basins. Alternatives B, Modified B, C, D The number of miles at high risk are similar at the drainage basin scale. Alternative E Fewest miles of streams at high risk for all drainage basins. Miles of streams at high risk decreases from 105 to 22 in the SFAR drainage basin and 85 to 42 in the COS drainage basin.	For most stream systems, less than 10 percent reduction in the miles of streams at high risk of adverse effects to aquatic habitat from routes. For four stream systems, 16 to 77 percent reduction in the miles of streams at high risk of adverse effects to aquatic habitat.[3] Alternative E would result in the greatest percent reduction (48 to 77%), followed by Modified B (32 to 50 %). The river system with the greatest overall percent reduction - 47 to 68 percent - is the North Fork Cosumnes River.

[1] The four drainage basins in the Eldorado National Forest (ENF) are the North Fork American River (NFAR), South Fork American River (SFAR), Cosumnes River (COS), and Mokelumne River (MOK).

[2] Alternative A (no action) would result in 14.7 miles of streams at a high risk of adverse effects from unauthorized routes (NSR and NSA routes), Alternative B would result in 0.8 miles of such streams, and all other action alternatives (Alternatives C, D, E, and Modified B) would result in zero miles of such streams.

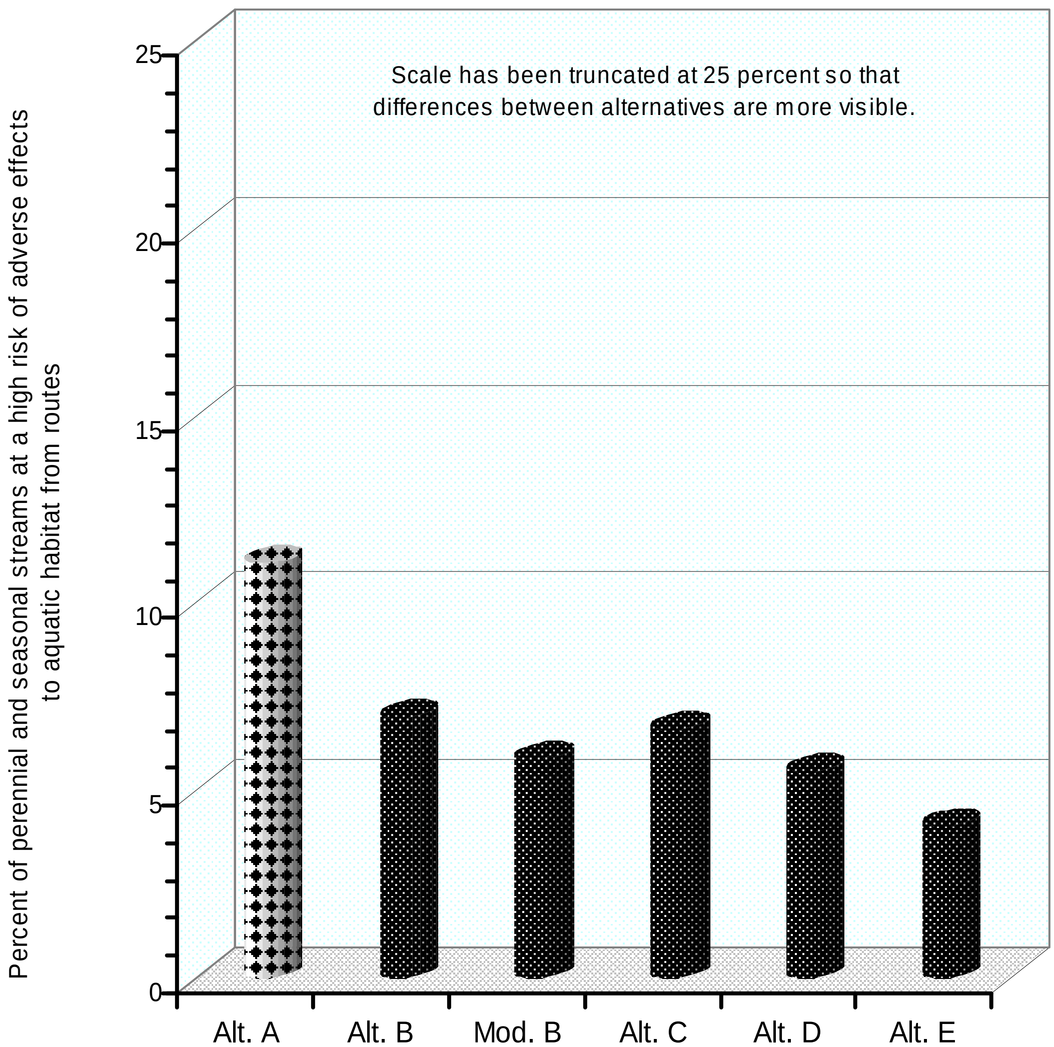
[3] The four stream systems are the Silver Fork American River, Alder Creek, Camp Cr., and North Fork Cosumnes River.

Table 3-D.6: Number of streams at a *high risk* of adverse effects to aquatic habitat from unpaved roads and trails (routes) for each alternative using Indicator Measure 1.[1,2,3,4]

		Number of streams at high risk					
	Stream system	Alt. A (no action)	Alt. B	Mod. B	Alt. C	Alt. D	Alt. E
SFAR	Silver Fork American River (includes Caples Cr.)	20	7	7	10	7	2
	Alder Creek	17	7	7	13	7	6
	Silver Creek	13	12	12	11	10	9
	Tributaries of Slab Creek Reservoir	5	4	4	3	3	3
COS	Camp Creek	12	7	5	11	9	7
	North Fork Cosumnes River	17	8	8	8	7	5
	Steely Fork Cosumnes River (includes Clear Cr.)	7	6	6	5	4	5
	Dogtown Creek (includes McKinney Cr., Middle Dry Cr.)	13	11	9	10	10	6
	Middle Fork Cosumnes River (includes Cat Cr.)	17	15	15	15	11	8

[1] SFAR = South Fork American River drainage basin. COS = Cosumnes River drainage basin.
[2] The North Fork American River and Mokelumne River drainage basins contain few streams that are at a high risk of adverse effects to aquatic habitat. Therefore, those two drainage basins were not included in this Table.
[3] A *stream system* includes all perennial and seasonal (intermittent) tributaries.
[4] Alternative A is no action. The action alternatives are Alternatives B, Modified B, C, D, and E.

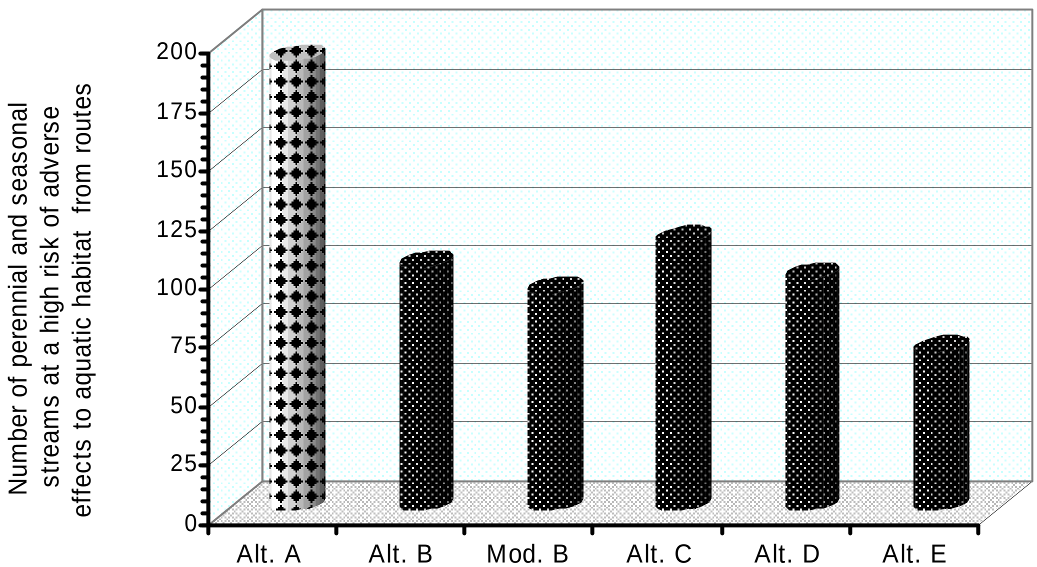
Figure 3-D.3: Percent of perennial and seasonal streams in the Eldorado National Forest at high risk of adverse effects to aquatic habitat as a result of unpaved roads and trails (routes) for each alternative



For Alternative A (no action), approximately 10.6 percent of the streams in the ENF are at high risk of adverse effects to aquatic habitat as a result of routes. For the action alternatives (Alternatives B, Modified B, C, D, and E), the percent of streams at high risk ranges between 4.1 percent (Alt. E) and 6.9 percent (Alt. B). At the scale of the entire ENF, this means that all of the action alternatives reduce the percent of streams at high risk by less than 6.6 percent when compared to Alternative A (no action).

Figures 3-D.4 and 3-D.7 (below) show the number and miles of streams at high risk of adverse effects to aquatic habitat from unpaved roads and trails (routes) for each alternative according to Indicator Measure 1. Under all action alternatives (Alternatives B, Modified B, C, D, and E), the number and miles of streams at high risk would decrease by at least 39 percent when compared to Alternative A (no action); the reduction would be the greatest (at least 65 percent) under Alternative E, followed by Modified B.

Figures 3-D.4 and 3-D.5: Number and miles of perennial and seasonal streams in the ENF at high risk of adverse effects to aquatic habitat from unpaved roads and trails (routes) for each alternative according to Indicator Measure 1



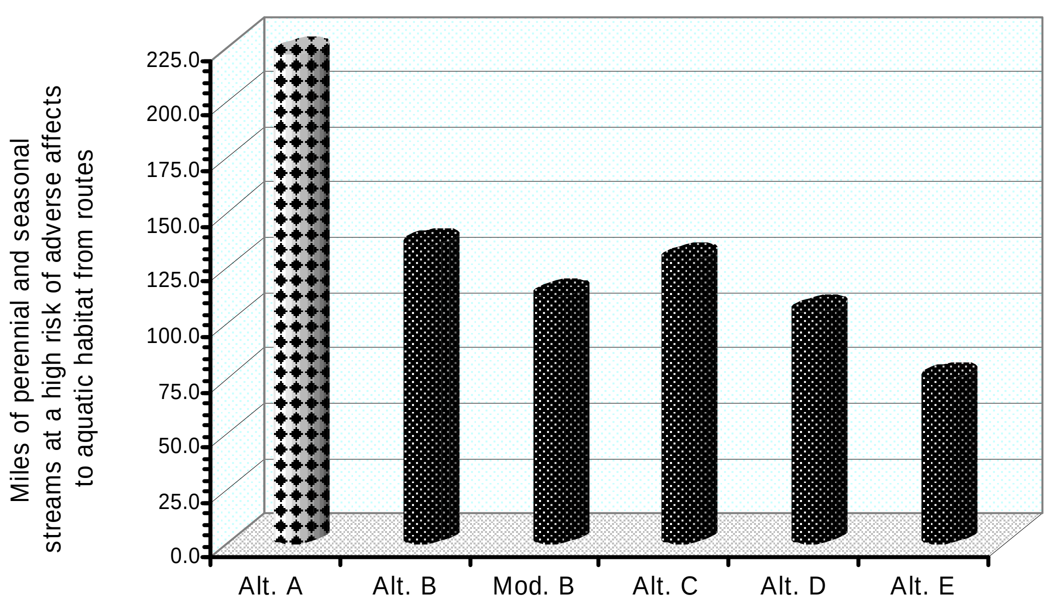


Figure 3-D.6: Miles of streams at high risk of adverse effects to aquatic habitat from unauthorized routes (NSA and NSR routes) for each alternative

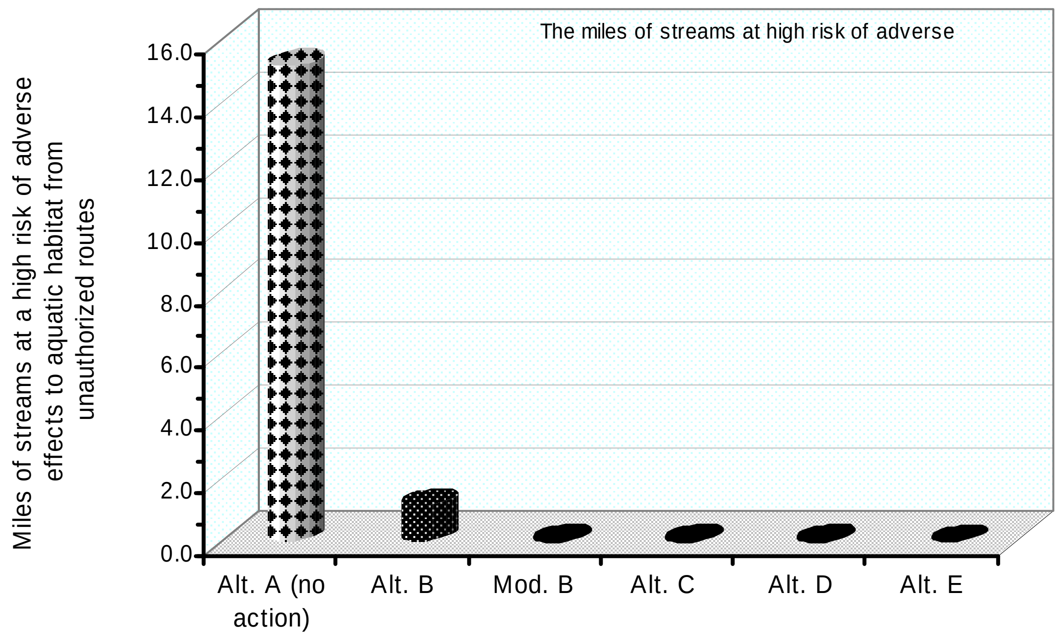
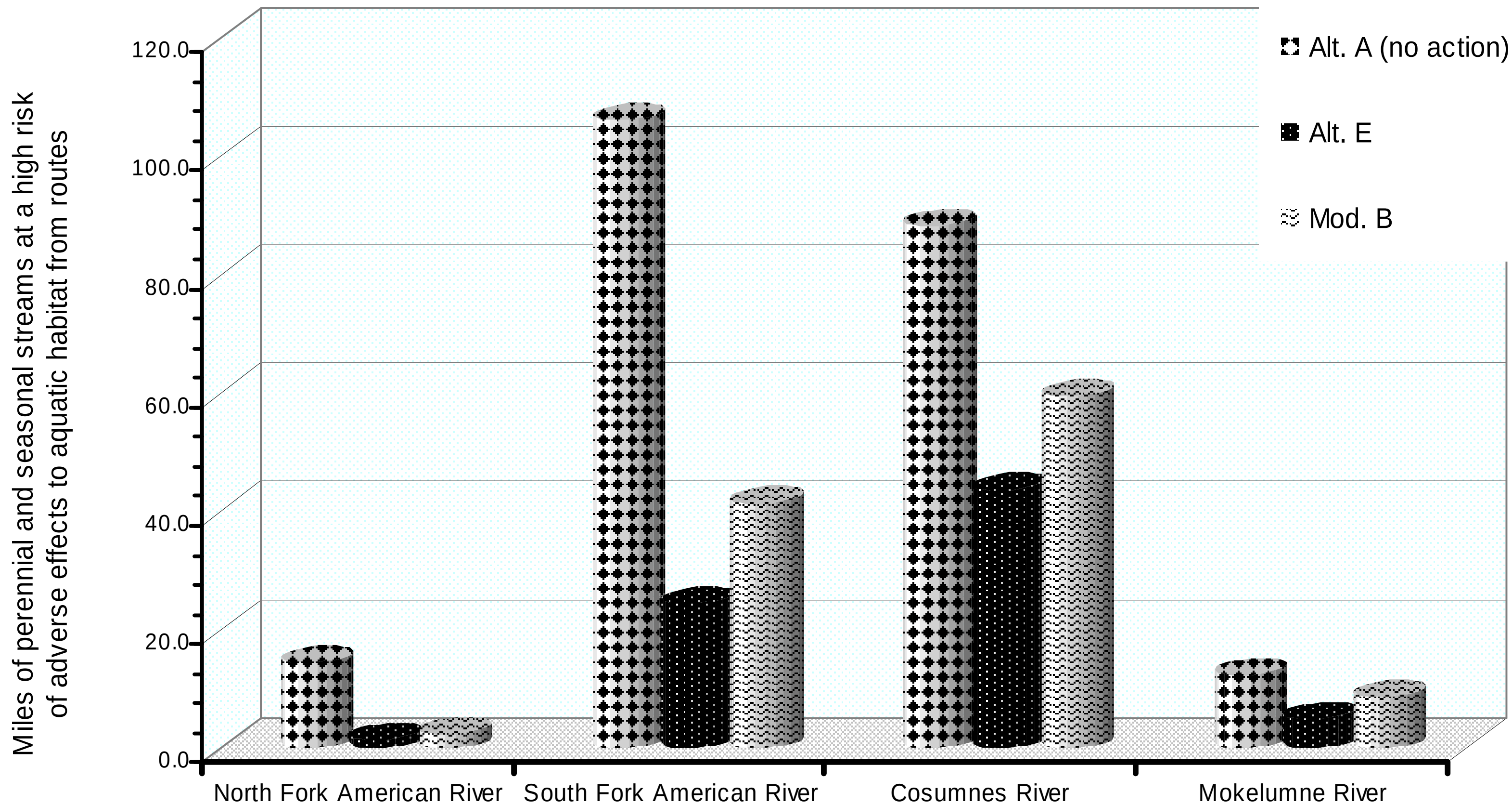
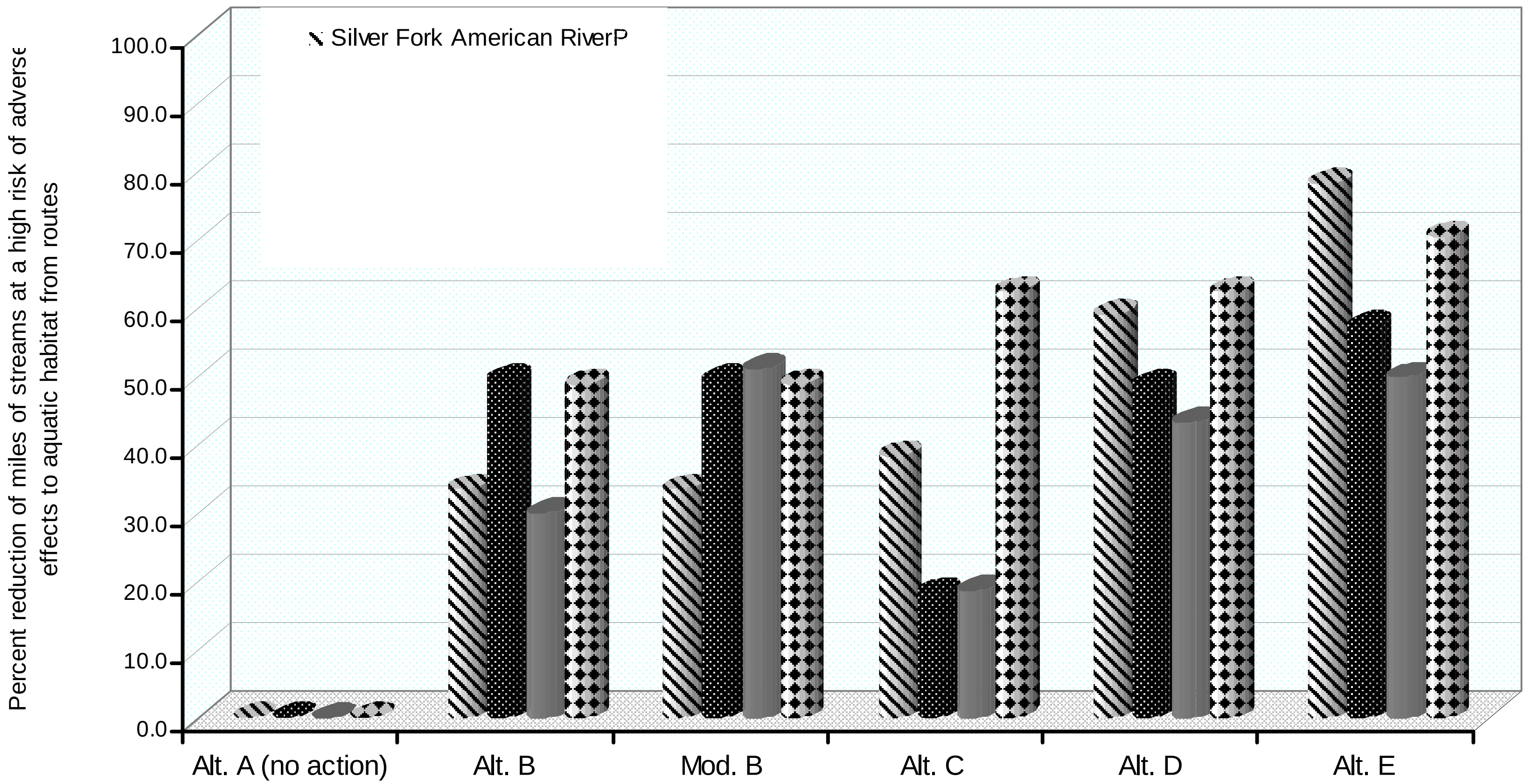


Figure 3-D.8: Miles of perennial and seasonal streams at high risk of adverse effects to aquatic habitat for the four drainage basins in the ENF



Alternative A (no action) would result in the largest number and miles of streams at high risk of adverse effects to aquatic habitat from unpaved roads and trails (routes). Alternative E would result in the fewest miles of streams at high risk, followed by Modified B. Alternatives B, C, and D are similar to Modified B at the drainage basin scale.

Figure 3-D.9: Percent reduction in the miles of streams at a high risk of adverse effects to aquatic habitat for four stream systems.



Cumulative Effects

Defintion and scope of analysis. The analysis of cumulative effects considers all past, present, and likely future land disturbances in the Eldorado National Forest (ENF). In ENF, the major potential cumulative effect is the degradation of habitat for aquatic and riparian species.[1] This can result when land disturbances - roads, timber harvest, wildfire, etc. - increase the amount of sediment delivered to aquatic features.

Past land disturbance. Much of the Eldorado National Forest (ENF) has been altered by both natural and anthropogenic land disturbances since the late 1800's. The major anthropogenic land disturbances include timber harvest, road building, mining, recreation, the building of dams, OHV use, human settlement, and the grazing of livestock. In general, the anthropogenic land disturbances have been more intense on the western edge of the ENF where private lands border the ENF. The most significant natural land disturbances since the late 1800's have been large wildfires and flood events.

- Timber harvest and/or fuels reduction activities have occurred on nearly 58,000 acres (90.6 square miles) in the past ten years. This is approximately 5.2 percent of the ENF.
- There are more than 3,000 miles of roads and trails in the ENF. All of the 7th field watersheds outside of wilderness areas contain roads.
- Approximately 55,700 acres (87.0 square miles) have burned in 42 wildfires in the ENF since 1997. This is approximately 5.0 percent of the ENF.
- A flood event occurred in many of the streams in ENF in 1997. There are a number of streams where channel erosion from that event is still evident.

Present land disturbances. The major on-going land disturbances in the ENF include timber harvest, fuels reduction activities, recreation, and OHV use.

Foreseeable future land disturbances. These include all of the current on-going land disturbances, as well as large wildfires and floods.

- In the ENF, 19 fuels reduction projects are planned on approximately 19,000 acres (29.7 square miles). This is approximately 1.7 percent of the ENF.
- Timber harvest will occur on a portion of the 2,752 acres of private lands contained within the ENF.
- Five recreation projects are planned in the ENF. Four of these projects will affect motor vehicle routes.
- One land exchange is planned, which involves a number of parcels scattered throughout the ENF.
- It is assumed that large wildfires and flood events will continue to occur. The size and location of these natural events, as well as the effects of these events to the condition of aquatic features and aquatic habitat, cannot be predicted.

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[1] A stream with adverse effects to aquatic habitat as a result of sediment from unpaved roads and trails generally shows one or more of the following characteristics: pools have been partially or completely filled-in with sediment, an excessive amount of fine-grained material occurs throughout much of the channel, the channel is wide and shallow, recent erosion of the channel is excessive, the streambanks are unstable.

Past, present and foreseeble future land disturbances in the ENF are listed in Appendix E.

Methods of analysis. There are two methods of analysis, described below**.**

1.) For each 7th field watershed in the Eldorado National Forest (ENF), the risk of the occurrence of cumulative watershed effects (CWE) is assigned to one of the following four categories: *low*, *moderate*, *high*, or *very high*. The assignment of the risk of CWE is based on a quantitative evaluation of the land disturbances in the watershed using the method of equivalent roaded acres (ERA). In the ERA method, an index is calculated for an entire watershed that expresses most land uses in terms of the percent of the watershed covered by roads. Based on the ERA and a threshold of concern (TOC), a given watershed is assigned a relative risk of CWE. The ERA method is described in more detail in Table 3-14.

2.) For specific stream systems in the ENF, there is a brief narrative discussion of the risk of cumulative effects. A method to quantitatively evaluate the risk of cumulative effects to aquatic habitat for individual streams and stream systems has not been developed in Region 5 of the Forest Service.

Analysis of the risk of cumulative effects. At the 7th field watershed scale, the risk of cumulative effects is not affected by any of the alternatives in this EIS. There are three reasons for this conclusion.

- None of the alternatives involve ground-disturbing activities or the creation of new impervious areas. As a result, the creation of additional equivalent roaded acres (ERA) under all alternatives is zero.
- Under all of the action alternatives, the closure of roads does not involve the physical removal of those roads and rehabilitation of the ground surface that those roads occupied.[1] Although many of these roads will re-vegetate naturally, re-vegetation of roads typically takes at least 20 years or more (Markman, per. comm. 2007). As a result, any reduction in the amount of ERA is many years in the future.
- At the 7th field watershed scale, the acres of roads that would be closed under all of the action alternatives - even assuming complete re-vegetation of the roads at some point in the future - is not enough to change risk of cumulative effects. This is because the number of acres of roads closed under all alternatives would result in less than 0.2 percent ERA for any individual 7th field watershed in the ENF and less than 0.1 percent ERA for most watersheds in the ENF. In the Headwaters Alder Creek watershed - where more miles of roads would be closed under the action alternatives than any other watershed in the ENF - the risk of CWE would remain *high* even if all roads and trails in the watershed were removed (Figure 3-12).

The majority of the 7th field watersheds in the ENF are at a *low* or *moderate* risk of cumulative watershed effects (Figure 3-13). The risk of cumulative watershed effects for most of the watersheds in the ENF is described in the Project File.

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[1] The removal of roads involves the excavation of culverts, the ripping of the road surface, and, in some cases, the re-contouring of the ground surface to blend in with the natural topography. Based on field observations in several National Forest in the western United States, it typically takes at least 20 years for closed roads to re-vegetate naturally (Markman, per. comm. 2007).

Table 3-D.7: The Equivalent Roaded Acre (ERA) method of assessing the risk of cumulative watershed effects (CWE).[1]

Summary
The ERA method assesses of the risk of cumulative watershed effects (CWE) for an entire watershed. An index is calculated for an entire watershed that expresses most land use in terms of the percent of the watershed covered by roads. Based on the equivalent roaded acres and a threshold of concern (TOC), a given watershed is assigned a relative risk – *low, moderate, high, or very high* - of CWE. The primary cumulative effect of concern is an increase in the amount of sediment delivery to streams and the resulting degradation of aquatic habitat. The ERA method was developed by Region 5 of the U.S. Forest Service and is used by the Eldorado National Forest.
Important aspects of the ERA method
Roads, which are considered to have the greatest potential to increase the amount of sediment to streams, are given a value of 1.0. The number of acres of roads in a watershed is divided by the size of the entire watershed (in acres). This gives the percent of the watershed covered by roads. For each land disturbance activity other than roads, the number of acres is multiplied by a number less than 1.0. The result (for each land disturbance activity) is then divided by the number of acres of the entire watershed. This gives the percent ERA in the watershed for each type of land disturbance. The values for equivalent roaded acres for all of the land disturbance activities are added together. The final number represents the percent of the watershed that is covered by the 'equivalent' of roads. The threshold of concern (TOC) for a watershed is usually between 10 and 18 percent. That is, when 10 to 18 percent of a watershed is covered by the equivalent of roads, there is a *very high risk* that an increase in the amount of sediment delivered to streams will occur. This does not mean these effects will occur precisely when the ERA reaches the TOC, or that an increase in sediment delivery to streams will automatically result in a degradation of aquatic habitat - it is a warning that such effects might occur.
Assumptions and limitations of the ERA method
Intended for watersheds between 2,000 and 10,000 acres in size. ERA values and the percent of the TOC cannot be used to determine the percent or numerical amount of increase of sediment delivery to streams, stream channel eroded, fish habitat degraded or lost, or any other change in watershed condition. Such quantitative assessments require additional analysis. The location of land disturbance activities within a watershed is not considered. For example, roads near streams are treated exactly the same as roads that are far from streams. In reality, roads located within or next to riparian areas tend to contribute more sediment to streams than roads in upland areas. Recovery of the watershed from land disturbing activities occurs with time. For timber harvest activities, hydrologic recovery is assumed to be thirty years (i.e. ERA is zero thirty years after timber harvest.) The ERA calculations do not take into account site specific Best Management Practices.
Risk categories
Low risk of CWE - ERA is less than 50% of the Threshold of Concern (TOC) Moderate risk of CWE - ERA is between 50% and 80% of TOC High risk of CWE - ERA is between 80% and 100% of TOC Very high risk of CWE - ERA is greater than TOC

[1] There are a number of methods that assess cumulative watershed effects (CWE). These methods cannot quantitatively predict the amount of sediment delivered to streams, the distance downstream that the sediment load will travel, the point in time and the duration when an increase in sediment delivery to aquatic features will occur, and the magnitude and duration of adverse effects to aquatic habitat and species. The reasons for this include the large variability in the magnitude of direct effects from a given land disturbance, inability to predict secondary or indirect effects, lack of data on recovery rates for land disturbances, difficulty of validating predictive

models on-the-ground, and the uncertainty of future events such as the size and timing of large storms. As a result, an assessment of CWE is frequently reported as an indicator of the overall risk of cumulative effects occurring in a watershed.

Figure 3-D.10: Risk of cumulative watershed effects (CWE) in the Headwaters Alder Creek watershed. The risk of CWE is *high*, regardless of the miles of roads removed

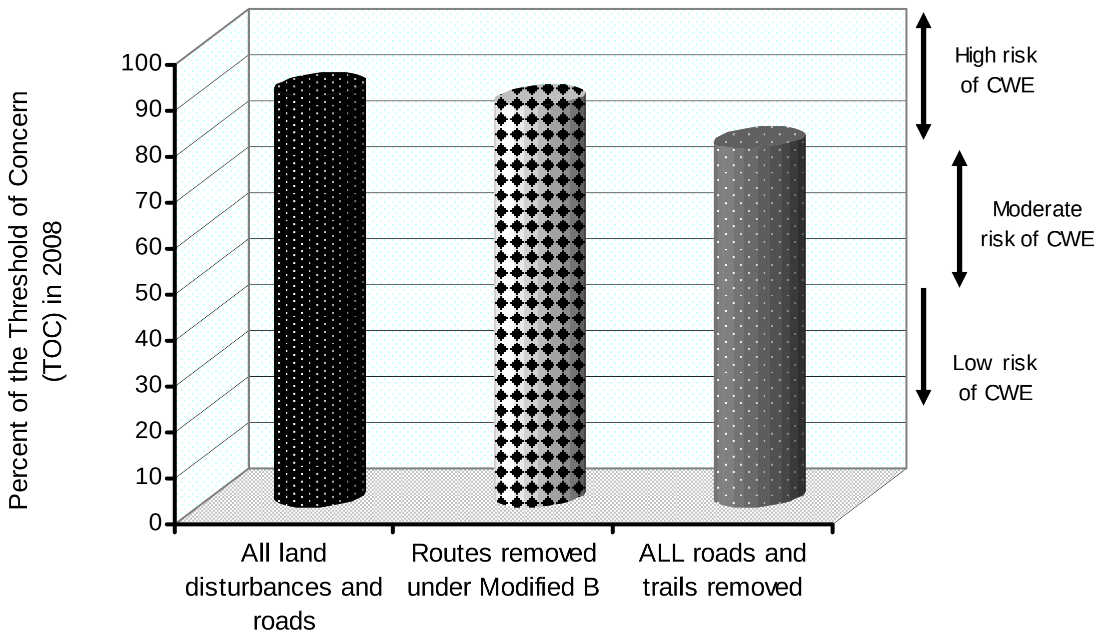
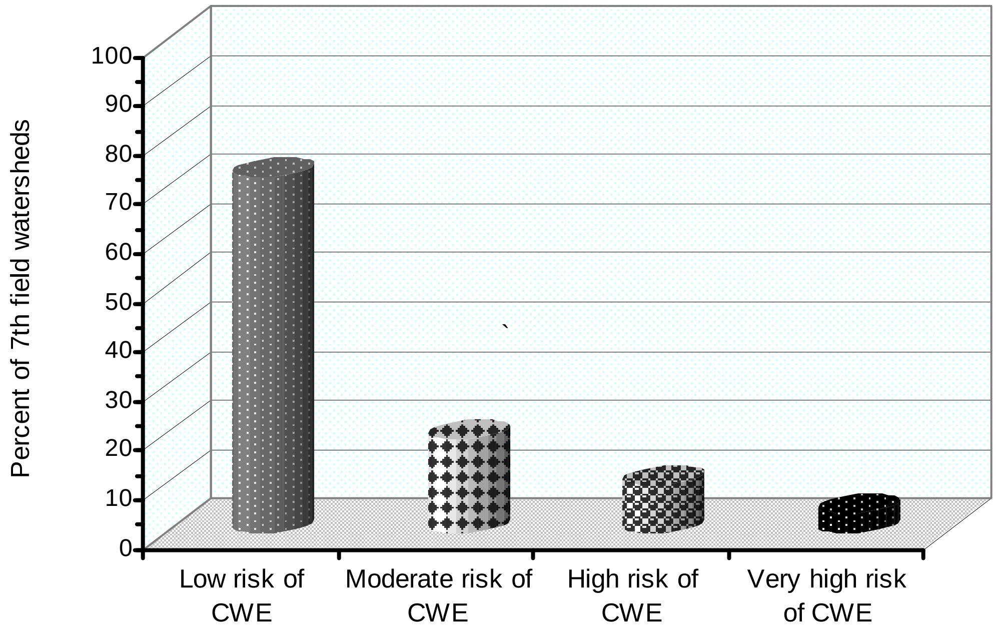


Figure 3-D.11: Percent of watersheds in the Eldorado National Forest (ENF) for each risk category of cumulative watershed effects (CWE) for all alternatives.



For four stream systems in the ENF, there may be a slight long-term *decrease* in the risk of cumulative effects as a result of the action alternatives (Alternatives B, Modified B, C, D, and E). There are four streams systems - Silver Fork American River, Alder Creek, Camp Creek, and the North Fork Cosumnes River - where there will be a 16 to 77 percent decrease in the miles of streams at a high risk of direct/indirect adverse effects to aquatic habitat as a result of the action alternatives. This in turn may result in a slightly lower risk of cumulative effects to aquatic habitat to those four stream systems after the re-vegetation of closed roads (more than 20 years in the future). This is the most likely to occur under Alternative E, followed by Modified B; the reason for this is that Alternative E would result in the largest reduction in the number and miles of streams of aquatic habitat at high risk of direct/indirect adverse effects from unpaved roads and trails, followed by Modified B. However, several timber harvest and fuels reduction projects - both currently in progress and scheduled to occur - will *increase* the risk of cumulative watershed effects (CWE) for a number of years in several 7th field watersheds that are part of the river systems of Alder Creek, Camp Creek, and the North Fork Cosumnes River. The increase in the risk of CWE from these timber harvest and fuels reduction projects may slightly overlap with the slight long-term decrease in the risk of cumulative effects to the four stream systems that may occur under all of the action alternatives.

Conclusions

Alternative A (no action) does <u>not</u> benefit water quality, protect beneficial uses of water, and meet all of the Riparian Conservation Objectives (RCOs) contained in Sierra Nevada Forest Plan Amendment (SNFPA) of 2004. All of the action alternatives (Alternatives B, Modified B, C, D, and E) would benefit water quality and protect beneficial uses of water to some degree; the greatest benefit would occur under Alternative E, followed by Modified B. In addition, Alternatives E and Modified B are expected to meet all of the RCOs. These conclusions are based on the consideration of all of the following: 1) the number and miles of streams at a high risk of being adversely affected by unpaved roads and trails (routes), 2) the miles of routes through meadows, 3) the length of time period of seasonal route closures, and 4) the restriction of motorized public vehicle use to designated routes (prohibition of cross-country travel).

The four stream systems that are likely to show the greatest benefit in terms of water quality and aquatic habitat as a result of the action alternatives are the Silver Fork American River, Alder Creek, Camp Creek, and the North Fork Cosumnes River. Alternative E would likely provide the greatest benefit, followed by Modified B.

The risk of cumulative effects at the 7th field watershed scale is <u>not</u> affected by any of the alternatives in this EIS. However, all of the action alternatives may slightly reduce the risk of cumulative effects to aquatic habitat in four stream systems after the re-vegetation of closed roads (more than 20 years in the future). Those streams systems are the Silver Fork American River, Alder Creek, Camp Creek, and North Fork Cosumnes River.

The above conclusions rely on two assumptions that are supported by existing published research: 1) the closure of unpaved roads and trails near streams to public use would in time result in less sediment being delivered to those streams, and 2) this in turn would lower the risk of adverse effects to aquatic habitat. An evaluation of the actual condition of the aquatic habitat of streams would require on-the-ground field surveys after routes have been closed to public use.

E. Range

Affected Environment

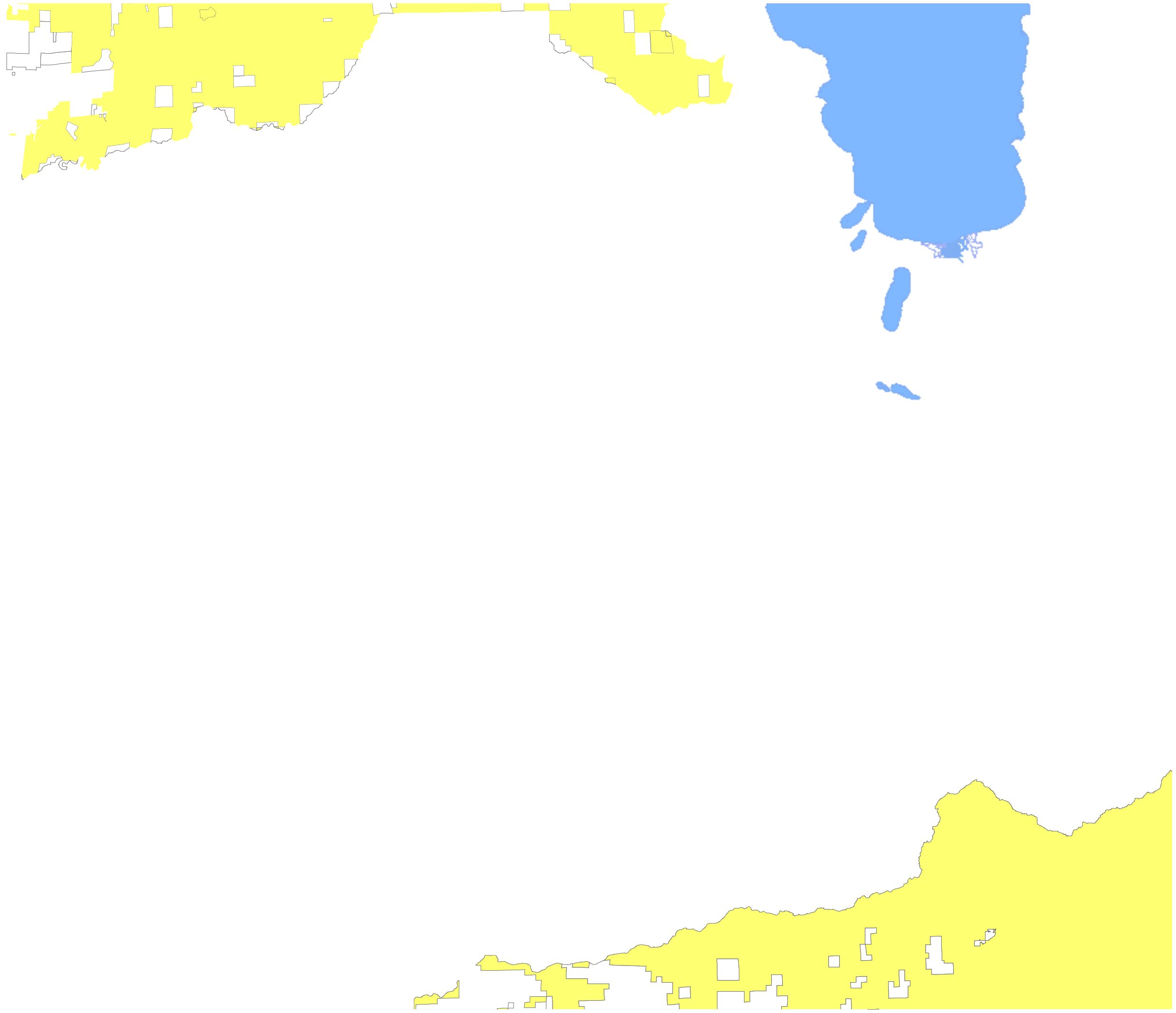
The ENF is currently divided into 24 grazing allotments (Map 3) comprised of 395,535 acres of national forest land and 143,403 acres of private land, of which approximately 110,000 acres are suitable for forage on NFS lands. The ENF potentially provides 8,300 Animal Unit Months (AUMs). One AUM is defined as the amount of forage to feed, on average, one mature cow for one month, which equates to about 26 lbs of dry forage per day (USDA FS 2001a). Of the 24 ENF grazing allotments, nine are currently active: Bear River, Chipmunk, Cody Meadow, Corral Flat, Morrison, Old Pino, Pardoe, Sherman, and Sopiago. These nine active allotments provide 6,609 AUMs annually.

The Forest Service Manual (FSM) directs the ENF to develop or maintain sustainable land uses that contribute to economic goals of providing livestock forage from lands suitable for grazing, and opportunities for economic diversity by promoting stability for communities that depend upon range resources for their livelihood (FSM 2203.1; 36 CFR 222.2(c); USDA FS 1989). In 2005, cattle, beef, and range pasture were in the top five commodities for Amador, El Dorado, and Placer counties (California Farm Bureau Federation 2007). National forest grazing allotments provide high protein, green forage during the summer that is critical to the seasonal forage supply for ranchers. The current range resource management goal on the ENF is to maintain or improve range conditions (USDA FS 1989).

On the ENF, there are two types of range: transitory and permanent. Permanent or primary range consists of mountain meadows, stringer meadows, and riparian vegetation comprising less than 20 percent of ENF allotment acres. Transitory range consists of shrubs, small trees, forbs, and grasses and is suitable for short periods of time, generally created by land disturbances such as timber harvest or wildfire. Transitory range with a higher proportion of early seral vegetation provides higher capability for grazing. Although there is less acreage of primary range in relation to transitory, primary range provides up to 20 times more forage than transitory.

The season-long grazing management method is used on allotments with transitory range. Under this grazing system, livestock need to be evenly distributed as forage is utilized to prevent overgrazing or underutilization in areas. Cattle will often self-disperse before reaching the utilization standard if there are no barriers to dispersal. The deferred grazing system is used on allotments with permanent range which tend to have fenced pastures that prevent livestock from entering too early or to keep them out once utilization has been met. Management on all allotments requires vehicle access by large trucks to key locations to move livestock on and off seasonally. Access to the allotments for herding and facility maintenance is accomplished by motorized vehicle and horseback.

Livestock grazing has occurred on the ENF since at least the mid to late 1800s. Historic accounts indicate that during this time period several thousand sheep and cattle grazed on the land that would become the ENF (Podsiadlo 2006). According to early allotment records, the total number of livestock grazing on NFS lands was reduced by the mid-1930s, from several thousand sheep and cattle to 200 to 600 cattle and/or cow/calf pairs on each allotment, with very limited use by sheep. Longhurst et al. (1952) estimated that by 1948, the number of cattle and sheep grazing on NFS lands had been reduced by 73 percent from the historic high levels in the early 1900s. In allotments on the ENF, range records indicate that numbers have been further reduced.



Analysis Framework

The focus of this analysis is on the potential effects to livestock grazing operations and rangeland resources within allotments on the ENF from public wheeled motor vehicle use of roads and trails. This analysis is focused on active allotments and those that could become active in the foreseeable future. All allotments were considered because they could be reactivated in the future. Most of the available information on effects is associated with active allotments.

There are a variety of ways operations on allotments can be effected including impacts to livestock health, livestock use and distribution patterns, allotment improvements, rangeland health and allotment capability. Three indicator measures were developed to analyze and compare the degree to which the alternatives may result in public wheeled motor vehicle associated effects. These indicator measures will address Significant Issue 2.8 – Impacts to grazing allotment capabilities and livestock. Table 3-E.1 summarizes factors that may impact allotments and the effects of those factors.

Data and Assumptions

For a discussion of the data and assumptions used in this analysis see the beginning pages of Chapter 3.

Indicator Measures

Indicator Measure 1: Route density within grazing allotments.

Indicator Measure 2: Number of routes that cross pasture boundaries or allotment boundaries.

Indicator Measure 3: Route density through meadows within grazing allotments.

Table 3-E.1: Road and trail associated indicator measures for livestock grazing

Indicator Measure	Route Factors	Effects
1. Route density	Motorized vehicle access to areas of allotments	Increased density reduces areas for livestock to avoid interactions, which sometimes impacts livestock health.
	Human activities such as dispersed camping and OHV riding	Increased camping and OHV use on allotments may cause animal stress and changed grazing use patterns. Vegetation may be impacted and result in loss of forage.
	Motorized routes in areas of potential forage	Available forage is reduced by the area comprised of road beds.
	Access for range allotment management	Roads used for allotment management may not be open to wheeled motorized vehicles.
2. Routes across boundaries	Livestock containment and management including gates and cattle guards	The number of gates and cattle guards increases as the number of routes crossing allotment boundaries increases. Increased likelihood for gates to be left open by the public, and thus increased permittee patrols to monitor gates and manpower to recover escaped livestock, as the number gates increases. Increased potential for livestock to move into areas not ready for grazing with increase in number of gates. Potential for livestock to enter highway corridors and possible collisions.
3. Routes through meadows	Primary forage condition and livestock use patterns	Motorized routes in meadows may affect the amount and productivity of primary forage and use patterns of livestock grazing and watering in these areas.

Indicator Measures

Indicator Measure 1*:* Route density within grazing allotments is an indicator of multiple inter-related effects that result from motorized vehicle routes. Associated with increased route density there is an increase in public access and a corresponding increase in a wide range of associated human activities outside developed use areas. Route density increases access to areas for recreation such as dispersed camping, picnicking and hunting as described in the recreation section. Where the route density is comprised of concentrated road and trail opportunities, OHV riding and related activities increases.

Increased route density reduces areas for livestock to avoid vehicle and human interactions. Vehicle access and associated human uses sometimes leads to effects on livestock such as inadvertent spooking and livestock running from perceived danger as well as some intentional chasing by motorized vehicle users. These conditions sometimes lead to altered grazing use patterns, livestock stress, weight loss and related health problems.

Dispersed camping and other associated uses such as OHV riding are sometimes concentrated in watering and high forage locations which may lead to changed livestock use patterns and avoidance of some forage areas.

Routes open for public wheeled motor vehicle use reduce forage availability on allotments because vegetation is not available on route beds that remain open. Associated uses such as dispersed camping off routes may also impact vegetation and reduce available forage.

Reduction of route density could lead to fewer routes available for grazing permittees in the management of their allotments. Permittees could pursue a special use permit for road use if vehicle access is not available for an area needed for their operations, however they would be responsible for permit and maintenance costs.

Indicator Measure 2: Routes crossing pasture or allotment boundaries that require physical barriers such as gates or cattle guards allow the opportunity for unauthorized livestock movement into areas outside of the allotment or into adjoining pastures.

As the number of gates on routes increases, there becomes a higher likelihood of gates left open or damaged, allowing livestock to move off the allotment or to enter a pasture that may not be ready for grazing. When livestock escape fencing, they can move outside of the allotment onto adjacent range allotments, other national forests, areas too wet for grazing, or highway corridors. Livestock escape can lead to vegetation, soil, or water quality damage and vehicle collisions.

Permittee costs increase when the number of gates on an allotment increases because of the time required to check gates, close opened gates, repair or replace gates and to locate and return escaped livstock. Range facilities are government property, so government costs also increase as the number of routes needing barriers increase. Costs include maintenance and cleaning of cattle guards and replacement of gate materials.

Indicator Measure 3: Routes through meadows within grazing allotments can result in effects to the amount and condition of forage and livestock use patterns.

As stated in indicator measure 1, routes open for public wheeled motor vehicle use reduce forage availability because vegetation is not available on route beds that remain open. The impact to grazing is intensified when routes affect meadows, which are pastures and primary forage areas. Livestock sometimes reduce use in areas in response to human presence which may cause change in utilization of primary forage.

Routes through meadows have the potential to affect the ecological condition which could result in a loss of productivity of primary forage areas and water sources and reductions in forage utilization.

Environmental Consequences

Direct and Indirect Effects - Introduction

Discussion of direct and indirect effects that are related to routes open for public wheeled motor vehicle use and their interactions with and impacts on livestock grazing are based on the above indicator measures. A complete review was conducted for each active allotment and associated routes.

Table 3-E.2 displays road, trail and route density for the national forest and private areas of the active and proposed active allotments with a summary for all allotments. Cumulative densities are displayed which include NFS maintenance level 3-5 and Rock Creek trails already designated. The change in density between Alternative A and the action alternatives displays the proposed variations between alternatives.

Table 3-E.2: Route density by active, proposed active and total of all allotments across all alternatives

Allotment		Cumulative Routes Alternative A			Cumulative Routes Alternative B			Allotment Acres
		Road Density[1]	Trail Density[1]	Route Density[1]	Road Density[1]	Trail Density[1]	Route Density[1]	
Bear River	NF	3.78	0.07	3.84	2.99	0.07	3.06	23,999
	NF+P[2]	4.45	0.05	4.50	3.78	0.06	3.85	31,386
Chipmunk	NF	3.00	0.06	3.06	2.00	0.04	2.04	18,545
	NF+P	3.51	0.04	3.55	2.89	0.02	2.91	36,770
Cody Meadow	NF	2.71	0.31	3.02	1.87	0.16	2.03	31,221
	NF+P	2.91	0.29	3.20	2.11	0.15	2.26	33,906
Corral Flat	NF	8.33	0	8.33	5.47	0	5.47	168
	NF+P	11.15	0	11.15	9.60	0	9.56	302
Morrison	NF	4.43	0.07	4.50	2.70	0	2.70	21,662
	NF+P	5.48	0.04	5.52	4.17	0	4.17	34,626
Nevada Point	NF	2.50	0.30	2.80	1.61	0.30	1.91	23,700
	NF+P	2.78	0.23	3.01	2.12	0.23	2.35	32,950
Old Pino	NF	1.96	2.15	4.11	1.02	2.33	3.35	38,297
	NF+P	3.45	1.04	4.48	2.81	1.13	3.94	79,255
Pardoe	NF	0.72	0.24	0.97	0.63	0.17	0.79	35,414
	NF+P	0.83	0.24	1.07	0.73	0.16	0.89	37,081
Sherman	NF	1.58	0.51	2.09	1.10	0.29	1.39	17,437
	NF+P	1.75	0.49	2.24	1.29	0.28	1.57	18,277
Sopiago	NF	6.35	3.84	10.19	4.81	2.61	7.42	6,251
	NF+P	5.33	3.20	8.42	4.07	2.20	6.15	7,624
Total All Allotments	NF	2.83	0.52	3.36	1.89	0.46	2.35	395,535
	NF+P	3.60	0.39	3.99	2.77	0.34	3.11	538,938

Allotment		Cumulative Routes Modified B Road Density[1]	Cumulative Routes Modified B Trail Density[1]	Cumulative Routes Modified B Route Density[1]	Cumulative Routes Alternative C Road Density[1]	Cumulative Routes Alternative C Trail Density[1]	Cumulative Routes Alternative C Route Density[1]	Allotment Acres
Bear River	NF	2.99	0.01	3.11	2.94	0.01	2.96	23,999
	NF+P	3.78	0.02	3.82	3.75	0.02	3.77	31,386
Chipmunk	NF	2.00	0.14	2.14	1.90	0	1.90	18,545
	NF+P	2.89	0.09	2.82	2.82	0	2.82	36,770
Cody Meadow	NF	1.87	0.51	1.93	1.77	0.08	1.85	31,221
	NF+P	2.11	0.47	2.15	2.01	0.07	2.08	33,906
Corral Flat	NF	5.47	0	5.47	5.47	0	5.47	168
	NF+P	9.60	0	9.55	9.56	0	9.56	302
Morrison	NF	2.70	0	2.79	2.70	0	2.70	21,662
	NF+P	4.17	0	4.17	4.17	0	4.17	34,626
Nevada Point	NF	1.61	0.30	1.91	1.53	0	1.53	23,700
	NF+P	2.12	0.23	2.41	2.05	0	2.05	32,950
Old Pino	NF	1.02	2.27	3.29	0.91	2.13	3.04	38,297
	NF+P	2.81	1.10	3.94	2.75	1.03	3.77	79,255
Pardoe	NF	0.63	0.60	0.80	0.62	0	0.62	35,414
	NF+P	0.73	0.58	0.90	0.72	0	0.72	37,081
Sherman	NF	1.29	0	1.21	1.07	0	1.07	17,437
	NF+P	4.81	2.61	7.47	1.27	0	1.27	18,277
Sopiago	NF	4.07	2.19	6.19	4.74	2.61	7.35	6,251
	NF+P	2.99	0.01	3.11	4.01	2.20	6.09	7,624
Total All Allotments	NF	1.89	0.51	2.34	1.83	0.38	2.22	395,535
	NF+P	2.77	0.38	3.09	2.72	0.28	3.01	538,938

Allotment		Cumulative Routes Alternative D Road Density[1]	Cumulative Routes Alternative D Trail Density[1]	Cumulative Routes Alternative D Route Density[1]	Cumulative Routes Alternative E Road Density[1]	Cumulative Routes Alternative E Trail Density[1]	Cumulative Routes Alternative E Route Density[1]	Allotment Acres
Bear River	NF	2.56	0.06	2.62	2.56	0	2.56	23,999
	NF+P	3.41	0.06	3.47	3.41	0	3.41	31,386
Chipmunk	NF	1.46	0.04	1.50	1.43	0.04	1.47	18,545
	NF+P	2.57	0.02	2.60	2.56	0.02	2.58	36,770
Cody Meadow	NF	1.33	0.10	1.43	0.78	0.01	0.78	31,221
	NF+P	1.60	0.10	1.70	1.09	0.01	1.10	33,906
Corral Flat	NF	5.47	0	5.47	5.47	0	5.47	168
	NF+P	9.24	0	9.24	9.24	0	9.24	302
Morrison	NF	1.45	0	1.45	1.38	0	1.38	21,662
	NF+P	3.13	0	3.13	3.08	0	3.08	34,626
Nevada Point	NF	1.25	0.20	1.45	1.18	0.28	1.46	23,700
	NF+P	1.82	0.15	1.96	1.76	0.22	1.98	32,950
Old Pino	NF	0.85	2.33	3.18	0.81	2.22	3.03	38,297
	NF+P	2.71	1.12	3.84	2.70	1.07	3.77	79,255
Pardoe	NF	0.63	0.17	0.79	0.25	0	0.25	35,414
	NF+P	0.73	0.16	0.89	0.35	0	0.35	37,081
Sherman	NF	0.79	0	0.79	0.69	0	0.69	17,437
	NF+P	0.98	0	0.98	0.90	0	0.90	18,277
Sopiago	NF	2.80	0	2.80	4.30	2.47	6.77	6,251
	NF+P	4.81	2.61	7.42	3.64	2.08	5.62	7,624
Total All Allotments	NF	1.55	0.44	1.99	1.33	0.38	1.71	395,535
	NF+P	2.49	0.32	2.81	2.32	0.28	2.60	538,938

[1]Route density is measured in miles per square mile.
[2] NF = National Forest Lands, P = private lands.

Direct and Indirect Effects – Alternative A

Alternative A contains the highest density of motorized routes within active and inactive allotments open for use on NFS lands, as well as the highest density of routes open for use on NFS and private lands. It also contains the highest number of routes crossing allotment or pasture boundaries and routes through meadows. In addition, routes are open year round.

Indicator Measure 1: The identified effects to range resources increase as the density of motorized routes and associated public uses also increase. Alternative A has an average route density of 3.36 mi/mi², road density of 2.83 mi/mi², and trail density of 0.52 mi/mi² for the national forest portion of allotments as shown in Table 3-E.2.

Route density for active allotments – Bear River, Chipmunk, Cody Meadow, Corral Flat, Morrison, Old Pino and Sopiago and proposed active allotment– Nevada Point in Alternative A, ranges from 0.97 mi/mi² for Pardoe allotment to 8.33 mi/mi² in Corral Flat allotment and 10.19 mi/mi² for Sopiago allotment. The wide variation reflects the size of the allotment, whether portions of the allotments are located within wilderness or roadless areas and whether a concentrated trail system exists within the allotment.

Road density for Alternative A ranges from 0.072 mi/mi² on Pardoe allotment to 8.33 mi/mi² on Corral Flat allotment, followed by 6.35 mi/mi² on Sopiago allotment.

Trail density for Alternative A also varies widely by allotment from zero on multiple allotments to 2.15 mi/mi² on Old Pino allotment and 3.84 mi/mi² on Sopiago allotment. The high route density in these allotments is related to the concentrated trail systems.

There is a high incidence of impacts to range resources on the Sopiago and Old Pino allotments that are associated with the density of the road and trail system and the human uses associated with the OHV opportunities in these areas. These areas have experienced impacts from trail riding and dispersed camping leading to spooking and stress to livestock. Livestock health and distribution patterns have been adversely affected.

The average route density in the Pardoe allotment is low because much of the area is Wilderness. However, areas of the Pardoe allotment with motorized routes have experienced impacts such as OHV use and dispersed camping in meadow areas.

Although there have been impacts to range resources in the Corral Flat allotment from motorized vehicle uses, there have not been consistent impacts. The high route density is reflective of the small size of the allotment and not conditions likely to lead to a high level of impact.

Indicator Measure 2: The identified effects to range resources increase as the number of routes open for motor vehicle use that cross pasture and allotment boundaries increases. Alternative A contains 212 routes that cross allotment or pasture boundaries, as shown in Table 3-E.3. The number of gates is proportional to the number of roads and trails that cross boundaries and pastures. Gates may be prefabricated metal or constructed from wire and posts. Cattle guards are generally limited to paved routes.

Alternative A has the highest potential for gates to be left open or damaged, allowing livestock to move off the allotment onto adjacent range allotments, other national forest areas too wet for grazing or highway corridors. Livestock escape has lead to resource damage and impacts to livestock health. In areas with increased numbers of gates range permittees must spend additional time checking gates, completing repairs and trying to locate and return livestock when gates have not been closed.

In some areas fencing is only marginally effective in confining livestock to allotments because of the frequency of gates opened and not closed. The Sopiago allotment has experienced chronic problems with gates left open. Escape of livestock has affected grazing patterns, proper forage utilization, and caused difficulty locating livestock at the end of the season. Old Pino allotment has also experienced a high level of impact from gates being left open or damaged. Cody Meadow, Sherman, and Bear River allotments have reported some impacts from livestock escape due to gates being left open.

Table 3-E.3: Comparison of Alternatives for Indicator Measure 2

Cumulative Routes		Alternatives					
		A	B	Mod B	C	D	E
Number of routes that cross allotment boundary	NF	212	150	190	141	136	128
	NF+P[2]	360	280	321	276	269	261

[2] NF = National Forest Lands, P = private lands.

Indicator Measure 3: Route density through meadows within grazing allotments can affect the amount and condition of available forage. Alternative A has the highest density of routes through meadows in active and vacant allotments with 9.26 miles, affecting 17.2 percent of meadows and 5.97 miles of routes, affecting 13.3 percent of meadows, respectively, as shown in Table 3-E.4.

The available primary forage is reduced by the area comprised of roadbeds. The loss of forage in areas of roadbed has a greater effect in meadows that produce primary forage than in other areas with transitory range. If the condition and productivity of meadows are affected from motorized routes or associated public uses, utilization standards may be modified to reduce forage available for livestock grazing. Meadows in Pardoe, Corral Flat and Cody Meadow allotments have been impacted by vehicle use in meadows.

Table 3-E.4: Comparison of Alternatives for Indicator Measure 3

Active Allotments		Alternatives					
		A	B	Mod B	C	D	E
Miles of routes in a meadow	Open	7.19	4.93	2.61	2.71	4.10	0
	Cumulative	9.26	7.57	4,53	4.63	6.00	1.86
Number of meadows with routes in the meadow	Open	81	54	43	36	41	0
	Cumulative	106	78	78	61	66	29
Percent of meadows with routes in the meadow*	Open	16.1	10.7	8.5	7.2	8.2	0
	Cumulative	17.2	12.7	12.7	9.9	10.7	4.7
Vacant Allotments		**A**	**B**	**Mod B**	**C**	**D**	**E**
Miles of routes in a meadow	Open	2.27	0.95	0.21	0.93	0.84	0
	cumulative	5.97	4.79	3.88	4.39	4.32	3.44
Number of meadows with routes in the meadow	Open	41	26	9	25	24	0
	cumulative	103	84	82	84	82	68
Percent of meadows with routes in the meadow*	Open	7.2	4.5	1.6	4.4	4.2	0
	cumulative	13.3	10.9	10.6	10.9	10.6	8.8

* Based on number of meadows with routes divided by total meadows on the ENF.

Note: Open includes all routes that are open for public wheeled motor vehicle use by Alternative in allotments. Cumulative includes ‘open’ and other routes already designated including Rock Creek OHV routes, routes on private land, surfaced NFS roads, and county/state roads within allotments.

Alternative A does not place a minimum seasonal closure on native surfaced routes. Wet season use of roads sometimes leads to rutting and driving off road to avoid damaged portions of the road. Impacts to road condition can make access by large cattle trucks difficult.

Action Alternatives B, Modified B, C, D and E

Direct and Indirect Effects

Indicator Measure 1: In the following order, Alternatives B, Modified B, C, D, and E result in progressively lower densities of motorized routes on NFS and private lands. All alternatives reduce motorized routes from Alternative A. These reductions would have a beneficial effect on range resources and grazing capabilities.

Under Alternative B and D, trail densities in the Old Pino allotment increase, despite overall route density reductions. This is from a few localized areas of high trail density not in Alternative A, such as the Poho Ridge area. Loops that would be open to public use overlap with a main forage area within the Old Pino allotment. Currently these loops are not open, but there have been impacts to grazing from other trails in this area. Opening these trails located in a main forage area will increase adverse effects to range resources.

Alternative E has the lowest trail density and would have the greatest potential for improved forage availability for livestock based on the establishment of early seral plants as closed routes reestablish vegetation. Increased forage would benefit allotments. With fewer routes, cattle have more space to forage without being near motorized vehicles, so reduced likelihood of altered grazing use patterns.

Alternative C has the second lowest trail density and would see some of the beneficial effects of Alternative E.

Indicator Measure 2: Alternatives Modified B, B, C, D, and E result in progressively lower numbers of motorized routes that cross allotment boundaries and the corresponding number of gates (Table 3-E.3). Reducing the number of routes that cross allotment boundaries potentially lowers the need for motorized users to close range gates and potential adverse effects to allotment management. The lowest impact to the grazing resource would occur under Alternative E, with 261 routes that cross boundaries.

Alternatives A, B and Modified B designate trail 17E16 located on the Cody Meadow Allotment. This trail is crossed by three range fences with gates and one additional gate is proposed. Alternatives C, D and E do not designate this trail which would have a beneficial effect on range management in this area.

Indicator Measure 3: In the following order, Alternatives B, D, C, Modified B and E result in progressively lower miles of routes in meadows on active allotments (Table 3-E.4).

Alternative E would have the least probability of adverse effects on meadows and associated forage and livestock management. Less area in road base, especially in primary forage areas, would increase availability of forage.

All alternatives would reduce impacts relative to Alternative A.

All action alternatives propose seasonal closures during the wettest part of the year. Alternatives B, Modified B and E have 3 month restrictions (January 1 through March 31) while Alternative D has a 5-month restriction (December 1 through April 30) and Alternative C has a 6-month restriction (November 1 through April 30). The seasonal closure from January 1 through March 31 under Alternatives B, Modified B and E will help reduce the impacts to road conditions. Permittees use large transport trucks on some roads to move livestock to and from the allotments. Road damage during wet season use makes access and transport difficult. All seasonal closures would improve protection of road conditions over Alternative A. All seasonal closures are outside the grazing season so there will not be a direct effect to grazing.

Cumulative Effects – All Alternatives

The cumulative effects analysis considers impacts of the alternatives when combined with past, present, and foreseeable future actions. A comprehensive list of such actions has been compiled (Appendix E). The geographic scope of the cumulative effects analysis is the grazing allotments. This was selected because impacts to range are confined to grazing allotments, which occur within the ENF on both public and private lands.

Past land disturbances include timber harvests which have contributed to a portion of the available forage in allotment transitory range. Approximately 17,000 acres of selective harvesting for fuels reduction is included in present and foreseeable future land disturbance actions. Fuel reduction projects are expected to provide some increased forage in transitory range. The amount of forage produced will vary depending upon type of vegetation, treatments and the remaining canopy cover.

The California Department of Forestry and Fire Protection (CAL FIRE) currently list 2,752 acres of planned timber harvests on private land within the ENF boundary. These projects may include a variety of harvest techniques, including clearcuts and selective harvests that will open up the canopy and provide increased forage production.

Harvest and fuels management projects are expected to provide beneficial effects to allotments by increasing acres of suitable forage. Road reconstruction and maintenance associated with these projects could also provide benefits to range management by improving access for cattle trucks. There may be some short term adverse effects to livestock management during project implementation such as impacts to fencing or gates and changes in livestock distribution patterns.

Grazing allotment management plans for Cody Meadow, Sherman and Chipmunk allotments are proposed to be revised to incorporate current standards. Nevada Point allotment is proposed to be analyzed for grazing capability and suitability and change to active status for allotment management. These proposed actions are expected to move allotments towards desired conditions.

Present treatment of noxious weeds is beneficial to rangeland health. Forage areas may be temporarily unavailable for grazing during treatments, however there is a long term beneficial effect to forage availability.

Foreseeable future recreation projects are expected to have minor effects to grazing. Other projects such as meadow restoration are expected to have beneficial effects.

The cumulative effects of past, present and foreseeable actions, combined with the direct and indirect effects to grazing operations and rangeland resources identified for all alternatives, would not have significant adverse effects to the capability and suitability of lands to provide livestock forage.

F. Endangered, Threatened, and Sensitive Plant Species

Affected Environment

The upper montane and subalpine areas include broad expanses of chaparral consisting of huckleberry oak, greenleaf, and pinemat manzanita, interspersed with extensive areas of rock outcrop as well as numerous wet meadows and springs. Within these larger communities exists a diversity of specialized communities, including slate outcrops, lava caps, riparian drainages, subalpine lakes, montane meadows, and fens. These communities provide habitat for ENF sensitive plant species (Table 3-F.1).

Table 3-F.1: Status of the sensitive plants known or suspected to occur on the ENF

Species	E	T	P	S	SC	R
Allium tribracteatum				X	X	
Arctostaphylos nissenana				X	X	
Balsamorhiza macrolepis var. macrolepis				X	X	
Botrychium spp.				X	X	
Bruchia bolanderi				X		
Calochortus clavatus var. avius				X	X	
Cypripedium montanum				X		
Draba asterophora var. asterophora				X		
Draba asterophora var. macrocarpa				X	X	
Epilobium howellii				X		
Eriogonum tripodum				X		
Helodium blandowii				X		
Horkelia parryi				X	X	
Lewisia kelloggii ssp. hutchisonii				X		
Lewisia kelloggii ssp. kelloggii				X		
Lewisia longipetala				X	X	
Lewisia serrata				X	X	
Meesia triquetra				X		
Meesia uliginosa				X		
Navarretia prolifera ssp. lutea				X		
Packera [Senecio] layneae		X		X		X
Peltigera hydrothyria [Hydrotheria venosa]				X		
Phacelia stebbinsii				X	X	

(California Department of Fish and Game 2007; Federal Register 1996)
State & Federal Status: E = Federal Endangered; T = Federal Threatened; P = Federal Proposed;
S = Region 5/Sensitive; SC = Species of Concern (USFWS term for taxa that might be in need of conservation action); R = State/Rare.

Habitat for US Fish and Wildlife Service (USFWS) Threatened, Endangered, and Proposed species and ENF Sensitive plants (TEPS) is unevenly distributed across the analysis area. Habitat is grouped into two broad types: Upland and mid slope habitat and moist habitats – meadows and riparian areas. Most upland and midslope habitats supporting sensitive species consist of dry, rocky sites where edaphic (soil or substrate) limitations affect plant growth and species composition (e.g. lava caps, hard slate, granitic and volcanic balds, and serpentine soils). Other upslope and mid slope habitats include mixed conifer forest or forest openings. Moist meadow/riparian habitats include streamside zones, meadows, fens, seeps, and springs.

Upland and Mid Slope Habitats

Fifteen taxa are known primarily from rocky habitats or other habitats with edaphic limitations. Pleasant Valley mariposa lily and yellow bur navarretia are associated with gravelly lahar (volcanic mud flow soils also known as lava caps) although not necessarily exclusively. Pleasant Valley mariposa lily also is known from rocky or cobbly soils in forest openings and yellow bur navarretia, an El Dorado County endemic, can be found on soils outside the Ledmount soil series in forest openings. Three-bracted onion, which has not yet been found on the ENF, grows on gravelly lahar.

Nissenan manzanita grows on highly acidic slate and shale soils, often associated with closed-cone conifer forest. Parry's horkelia sometimes co-occurs with Nissenan (El Dorado) manzanita. It grows on stony, disturbed, slightly acidic soils under open canopies and is often found on Ione formation soils.

Big-scale balsamroot grows in a variety of habitats on sandstone, serpentine, or basalt outcrops. Although it has not yet been found on the ENF, it is expected to occur in similar habitats as the previous species. Layne's ragwort and tripod buckwheat occur on serpentinitic soils and Layne's ragwort also on rocky, gabbroic soils.

Kellogg's lewisia and the closely related Hutchison's lewisia, which has not yet been identified on the ENF, occur on granitic and volcanic balds. Hutchison's lewisia is reported to occur on slate soils (CNPS 2007).

Stebbins' phacelia occurs on dry, rocky, open sites (bedrock outcrops, rubble, or talus) on moderate to steep slopes or on ledges. Saw-toothed lewisia occurs on steep, nearly vertical cliffs in inner gorges, often in the mists of cascadi

The management emphasis for SIAs is to preserve the integrity of the special interest feature for which the areas were established.

Table 3-F.2: Botanical Special Interest Areas

Special Interest Area	Acres	Botanical Features Leading to Designation
Leonardi Falls Botanical	219	Concentration of plant communities that are normally found over a 20-30 mile range in the Sierras within a single basin; rare plant species; natural springs
Rock Creek Botanical2	426	Unique assemblage of plants more commonly associated with coastal climates; virgin forest; instructional purposes
Round Top Botanical/Geological	4033 (877)[3]	Diverse flora due to soils and geology; uncommon plants; plants usually found in the Great Basin; plant fossils indicate previous deciduous forest
Traverse Creek Botanical/Geological	224	Unique assemblage of plants; serpentine endemics; Layne's ragwort
Wrights Lake Bog Botanical	65	Drosera bog (fen); round-leaved sundew

[1] Source: ENF 1989

[2] The portion of the Rock Creek Botanical Interest Area that falls within the Rock Creek Recreational Trails area is outside the analysis area.

[3] 3,156 acres overlap the Mokelumne Wilderness Area.

Two of three Research Natural Areas (RNAs) located on the ENF are within the analysis area (Table 3-F.3). The RNAs belong to a network of federally administered public lands that were established to maintain biological diversity, to provide baseline ecological information, and to encourage research and university natural-history education. RNAs exemplify minimally disturbed ecosystems representative of the range of widespread and unique natural vegetation types. The RNA program in California is administered jointly with the USDA Forest Service Pacific Southwest Research Station.

Table 3-F.3 Research Natural Areas[1]

Research Natural Area	Acres	Target Element	Distinct Features
Peavine Point	1098	Ponderosa pine and California black oak	Old-growth Ponderosa pine
Snow Canyon[2]	703	Western white pine	Subalpine western white pine forest; distinctive mix of mountain and desert species; *Silene invisa*
Station Creek	749	Transitional forest type (sugar pine – white fir – rattlesnake plantain)	Important transition between mixed conifer forest of the mid-elevations of the Sierra Nevada and montane forests; old-growth stands of sugar pine and white fir as well as Douglas-fir

[1] Source: Cheng 2004

[2] Snow Canyon RNA is in the Mokelumne Wilderness Area and not within the analysis area.

Analysis Framework

The analysis area for TEPS plants includes all NFS lands within the administrative boundary of the ENF, except for those included in the Rock Creek Recreational Trails Plan and wilderness areas. Direct and indirect effects are analyzed within this boundary. Cumulative effects are analyzed for all NFS lands within the ENF administrative boundary.

Data & Methods

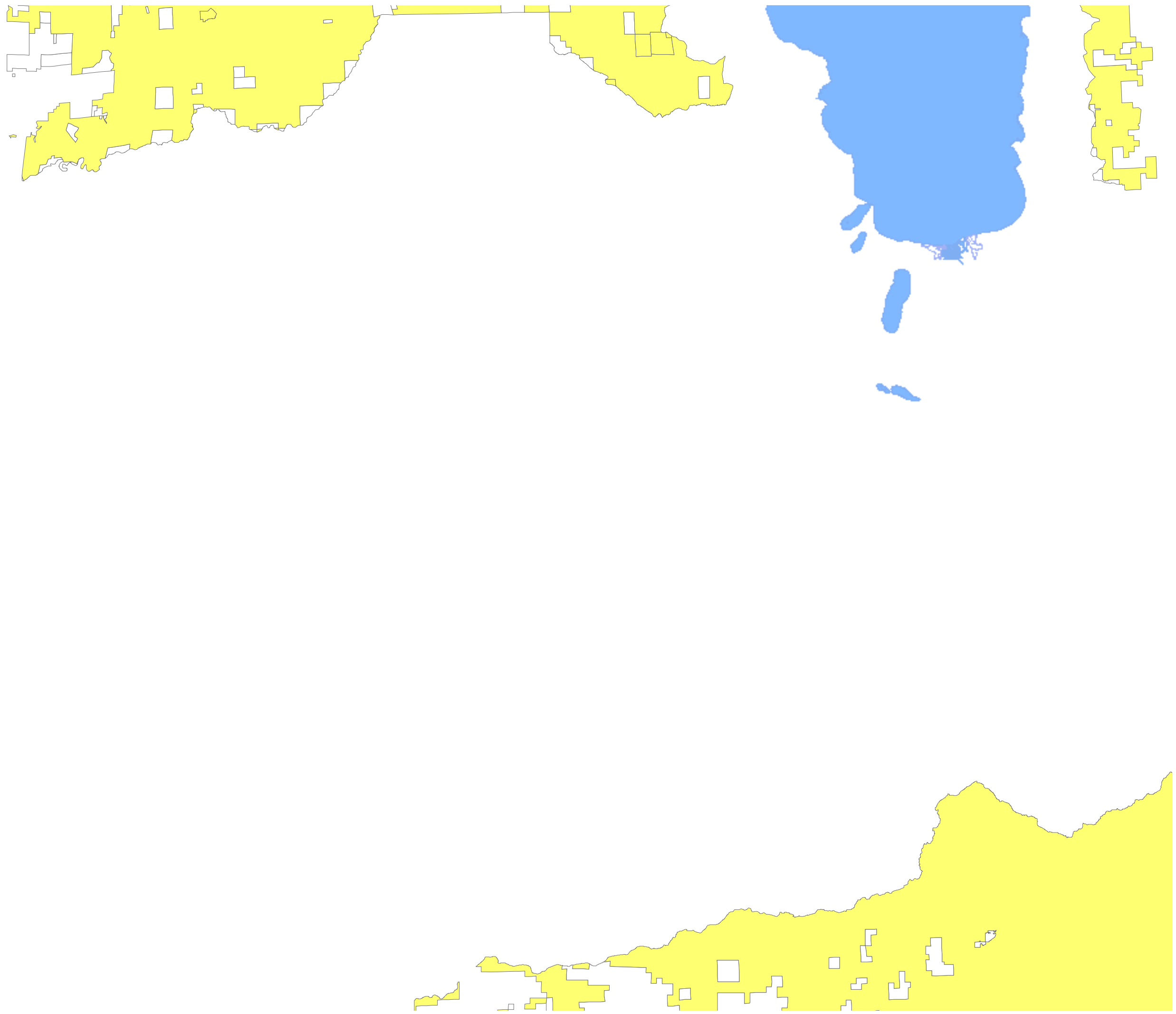
Habitats along native surface routes proposed for public wheeled motor vehicle use were analyzed for suitability for all TEPS plant taxa potentially occurring within the analysis area. Species restricted to wilderness [Tahoe draba (*Draba asterophora* var. *asterophora*), Cup Lake draba (*Draba asterophora* var. *macrocarpa*), and long-petaled lewisia (*Lewisia longipetala*)] were excluded from this analysis.

Habitat parameters for TEPS taxa were determined from a variety of sources, including: (1) the Eldorado National Forest Sensitive Plant Field Guide (ENF 2004); (2) Region 5 USFS Sensitive Plant Species Evaluation and Documentation forms (USDA FS 1998, 2006); (3) the California Native Plant Society Inventory of Rare and Endangered Plants of California (CNPS 2001; online version, CNPS 2007); (4) occurrence records and other information from the ENF sensitive plant files (1979 – 2007); (5) the Jepson Manual: higher plants of California (Hickman 1993), and (6) the Sierra Nevada Forest Plan Amendment FEIS, Volume 3, Chapter 3, Part 4.6 (USDA FS 2001).

Existing information was used to make determinations in the Biological Evaluation. The evaluation was accomplished through review of the ENF sensitive plant GIS layer (Map 4), ENF sensitive plant files, and the California Department of Fish and Game's Natural Diversity Data Base (CDFG 2007) listing of Forest Service sensitive plant population locations. Additionally, information on plant data from at least two decades of field surveys, monitoring, and personal field observations were utilized during the analysis.

Sensitive plant occurrence data have been collected forest-wide. During project work, surveys tend to focus on areas with potential habitat for sensitive and other special-status plant species. Because surveys were not distributed systematically across forest land allocations, the forest-wide range and distribution of individual taxa may be understated. Even when surveys occur at the appropriate time, plants may not be evident at that time. For example, some plants of Pleasant Valley mariposa lily may remain dormant in drought years and not produce even the single leaf characteristic of non-flowering individuals.

To obtain a sense of the coverage of project-level surveys, a GIS query identified the overlap of timber-related projects for which surveys would have occurred from 1998 through 2007 with unauthorized routes or ML-1 routes proposed to be open to the public in Modified B or Alternative E. Thirty-three projects were identified for the ten year period (see Biological Evaluation). These routes include 31 ML-1 routes and nine unauthorized routes to be open to the public in Modified B and seven unauthorized routes in Alternative E. Additional surveys would have occurred for recreation and other smaller projects during this same time period.



Of the 27 plant taxa on the ENF sensitive plant list (USDA FS 2006) and displayed in Table 3-F.1, 24 taxa (5 species in moonwort complex) are known (K) or suspected (P) to occur within the analysis area (Table 3-F.4). Three of the 24 taxa [Layne's ragwort (*Packera layneae*), tripod buckwheat (*Eriogonum tripodum*), and saw-toothed lewisia (*Lewisia serrata*)] do not have habitat adjacent to native surface routes being analyzed. The proposed project does not have the potential to affect these three species and they are not included in analysis.

Table 3-F4. Habitat description and rationale for determination of no effect for Threatened, Endangered, and Sensitive plant species within the ENF analysis area

Species	Presence on ENF	Potential for Effects Yes/No	Description of Habitat and Rationale For Determination Of No Effect
Allium tribracteatum	P	Yes	Three-bracted onion grows in chaparral, lower and upper montane coniferous forests on gravelly lahar (soils derived from volcanic mud flow, often referred to as "lava caps").
Arctostaphylos nissenana	K	Yes	El Dorado (Nissenan) manzanita grows on highly acidic slate and shale soils derived from a slight metamorphism of sedimentary rocks and is often associated with closed-cone conifer forest.
Balsamorhiza macrolepis var. *macrolepis*	P	Yes	Big-scale balsamroot occurs in ponderosa pine forest, chaparral,

Species	Presence on ENF	Potential for Effects Yes/No	Description of Habitat and Rationale For Determination Of No Effect
Horkelia parryi	K	Yes	Parry's horkelia grows in open chaparral and cismontane woodland, often on Ione formation soils. On the ENF it is found on metamorphic soils or schist in the transition from mixed foothill woodlands to pine forest. El Dorado County occurrences range from 2,400 to 3,400 feet.
Lewisia kelloggii ssp. *hutchisonii*	P	Yes	Hutchison's lewisia is found in openings in upper montane coniferous forest, often on slate soils and on soils that are sandy granitic to erosive volcanic with granitic boulders (granitic/volcanic balds) from 4,800 to 7,000 feet. It often grows on ridgetops or relatively flat open areas with widely spaced trees in partial to full sun.
Lewisia kelloggii ssp. *kelloggii*	K	Yes	Kellogg's lewisia is found on granitic and volcanic balds from about 5,000 to 8,000 feet. It often grows on ridgetops or relatively flat open areas with widely spaced trees in partial to full sun.
Lewisia serrata	K	No	Saw-toothed lewisia is restricted to steep nearly vertical cliffs in inner gorges of perennial streams and rarely near seeps and intermittent streams between 2,800 and 4,800 feet in the American River watershed. The project will have no effect on this habitat.
Meesia triquetra	K	Yes	Three-ranked hump- moss grows in cold, permanently saturated, spring-fed fens and meadows (usually acidic) in montane to subalpine coniferous forest from 4,200 to 9,700 feet. Two occurrences were located in 2006 & 2007, within 2 miles NE of Ice House Reservoir.
Meesia uliginosa	P	Yes	Broad-nerved hump-moss is found in permanently wet, primarily spring-fed meadows and fens in montane to subalpine coniferous forest from 4,200 to 9,200 feet.
Navarretia prolifera ssp. lutea	K	Yes	Yellow bur navarretia occurs in openings in or adjacent to mixed conifer forest or cismontane woodland on rocky ridgelines, saddles, or eroding ephemeral drainages from 2,300 to 5,000 feet, on gentle slopes with south to west aspects. It is often found on Ledmount soils, very shallow sandy loam, underlain by hard volcanic breccia. Only documented on the Placerville and Pacific RDs.
Packera layneae	K	No	Layne's ragwort[2] is found on rocky, gabbroic and occasionally serpentinitic soils in foothill woodland and chaparral habitats between 60 and 3,000 feet. Two of three known occurrences on the ENF are farther than 300 feet from ENF system or county maintained routes; one site is along Bear Creek Rd (ELD-46) on a steep rocky cut bank. This project proposes no routes for designation within unsurveyed serpentine habitat. This project will have no affect on this species.
Peltigera hydrothyria	P	Yes	Veined water lichen occurs in streams fed by cold water springs. Water must be very clear with peak flows not of the intensity that would lead to scouring.
Phacelia stebbinsii	K	Yes	Habitat for Stebbins' phacelia consists of dry, open, rocky areas on moderate to steep slopes, ofte

onion, big-scale balsamroot, Blandow's bog-moss, Bolander's bruchia, Hutchison's lewisia, Kellogg's lewisia, and veined water lichen) were added to the ENF sensitive plant list only in 2006, future surveys likely would locate additional occurrences of known species or potentially document occurrences of new species.

Upland Species and Mid Slope Species

The effects analysis for sensitive plants on the ENF showed five taxa (and their habitats) are most at risk from the impacts due to public wheeled motor vehicle traffic. These species are El Dorado manzanita, Kellogg's lewisia, Pleasant Valley mariposa lily, yellow bur navarretia, and Parry's horkelia. The rationale that these five species are most at risk is based on the fact that several occurrences of these species are present along routes being considered in all the Alternatives, and impacts from motor vehicles to one or more occurrences have been documented.

Two other species, three-bracted onion and big-scale balsamroot, have yet to be discovered on the ENF but occur in similar habitats as do Pleasant Valley mariposa lily, yellow bur navarretia, and Parry's horkelia. Some of these habitats, such as lava caps, have been subject to more frequent and thorough surveys than areas of the forest not suspected of having potential habitat for sensitive species. Hutchison's lewisia, which has not been identified on the ENF, occurs on slate soils and in similar habitats as does Kellogg's lewisia.

Stebbins' phacelia is found on the ENF with a few occurrences documented along routes. Its habitat is generally steep and rocky, and therefore less likely to be impacted by off-road vehicle activity. Disturbances from motor vehicles have not been documented (refer to Indicator Measure 2 in analysis).

Mountain lady's slipper inhabits slopes with dense over-story canopies. It is known from two sites on private land inholdings within the ENF administrative boundary, but to date, botanical surveys have not located this species on public lands within the ENF. Impacts to its habitat, while likely, have not been noted during surveys conducted since 2002Moist Habitats – Meadows and Riparian Areas

Eleven sensitive species (four with known occurrences) occupy moist habitats primarily at higher elevation meadows and riparian areas. Species within this group include subalpine fireweed, five sensitive moonwort species, Bolander's bruchia, Blandow's bog moss, three-ranked hump-moss, broad-nerved hump-moss, and veined water lichen. Three sensitive species (Bolander's bruchia, three-ranked hump moss, and subalpine fireweed) have been documented on the ENF only within the last two years. A fourth sensitive plant (*Botrychium* sp.) was located on private land inholding within the administrative boundary of the ENF in 2007.

Habitats for sensitive meadow/riparian species have been impacted by public wheeled motor vehicle traffic. The three occurrences of subalpine fireweed that were documented in 2007 occur along an open route in all alternatives but Alternative E. These three fireweed occurrences are at risk from motor vehicle traffic and two occurrences have documented vehicle impacts.

The single occurrence of Bolander's bruchia and the two occurrences of three-ranked hump moss are located in recently documented "fens" (special aquatic feature) in wet meadows on the Placerville and Pacific Ranger Districts. These occurrences have not been directly affected by motor vehicle traffic.

Assumptions

For a list of general assumptions with regard to this analysis refer to the beginning pages of Chapter 3. The following list is specific to the analysis for sensitive plants.

- Motor vehicle use on and off established routes has affected or has the potential to affect sensitive plant populations, either directly by damage or death to individual plants from wheel-traffic (stem breaking, crushing, etc.), or indirectly by altering the habitat through soil disturbance, changes in hydrologic functioning, or by the introduction of non-native, invasive plant species that can out-compete sensitive species for water, sunlight, and nutrients.
- Motor vehicle use is unlikely to impact certain sensitive plant habitats due to the steep or rocky nature of the surrounding terrain.
- Motor vehicle use is more likely to impact other sensitive plant habitats such as meadows and lava caps that exist on gentle slopes or flat terrain with little or no vegetation or natural barriers to motor vehicles.
- Wheeled motorized vehicle use of native surface routes increases sediment production and erosion, thereby potentially adversely affecting sensitive plant habitat. As use increases, sediment production and erosion will increase (for more detail, see soils or hydrology sections).
- All vehicles will need to be assumed “equal”.

Indicator Measures

Based on a review of the literature, and considering the variety of effects upon plants, the following general analysis measures were developed to compare the degree to which the alternatives may result in route or motorized vehicle use effects. The following indicator measures related to motorized vehicle use were applied to assess the impacts to individual species or habitats.

Indicator Measure 1: Distance from routes open for public wheeled motor vehicle use to sensitive plant sites.

Indicator Measure 2: Documented disturbances from motor vehicles that resulted in damage to individual sensitive plants or to habitat (sensitive plant monitoring reports).

Indicator Measure 3: Number of native surface routes within areas of suitable habitat where sensitive plant occurrences exist (i.e. lava caps).

Indicator Measure 4: Motor vehicle effects to riparian habitat, including meadows and streambanks (i.e., miles of native surface routes through meadows).

Measures used to determine effects to sensitive plants:

- Routes within 100 feet of a site/occurrence with documented impacts (from monitoring) = direct effects.
- Routes adjacent to a site/occurrence (<10 feet) = direct effects.
- Routes within 50 feet of a site/occurrence = potential direct and indirect effects.
- Routes between 50 and 100 feet of a site/occurrence = potential indirect effects.

Measures used to determine effects to sensitive plant habitat:

- Routes within 100 feet of a site/occurrence = potential indirect effects.
- Routes passing through meadows and lava caps = potential direct and indirect effects to habitat for the sensitive species.

- Routes infested with invasive plant species = potential indirect effects to sensitive plant habitat.

Note: This analysis uses the terms sensitive plant “site” and sensitive plant “occurrence”. These terms are not synonymous. A plant ‘occurrence’ is often composed of 2 or more discrete plant ‘sites’. Sites meeting specific criteria such as proximity are grouped into a single occurrence.

The rationale for each indicator measures is as follows:

Indicator Measure 1: A vehicle may park so that all parts of the vehicle are within one vehicle length from the edge of the road surface (when it is safe to do so and without causing damage to NFS resources or facilities), which is approximately 20 feet. Movement and activities, such as dispersed camping, around a parked vehicle tend to occur away from the road edge. Sensitive plant habitat on the ENF occurs primarily in open areas, such as meadows, lava caps, or granitic and volcanic balds. These habitats tend not to provide natural barriers or to limit movement. Damage to Kellogg’s lewisia, which occurs in open habitat, has been documented up to and beyond 50-feet from route edges. Under these conditions, 50 feet was judged a likely distance for limits of potential direct effects, such as trampling and crushing, to sensitive plants. The rationale for a 100-foot distance for the limit of potential indirect effects included a judgment that indirect effects from compaction, changes to drainage patterns, and spread of invasive species that compete with sensitive plants were most likely to occur within 100 feet. Little information is available to definitively quantify the distance from route edge in which direct and indirect effects occur within different habitats. These numbers represent a method to allow comparison among alternatives.

Indicator Measure 2: Direct effects consist of documented disturbances from motor vehicles that resulted in damage to sensitive plants or to their habitat as recorded in the ENF sensitive plant files. Habitat of occurrences within 10 feet of routes is assumed to be affected.

Indicator Measure 3: Lava caps are unique habitats and a watchlist plant community for the ENF. Two sensitive plant taxa known to occur on the ENF (i.e., yellow bur navarretia and Pleasant Valley mariposa lily) and one sensitive plant taxa with potential to occur (i.e., three-bracted onion) grow on lava caps. Lava caps are relatively level, open habitats comprised of low herbaceous vegetation and scattered low shrubs. They are highly roaded and, therefore, easily accessed. Damage to lava caps and to sensitive plant occurrences on lava caps have been documented on the ENF. The number of native surface routes within lava caps is a useful means of comparing potential effects to sensitive plant habitat among alternatives.

Indicator Measure 4: Meadows provide habitat for eleven sensitive plant taxa. Habitat is susceptible to changes in hydrology, sedimentation, compaction, rutting, and exposure of bare soil. Damage to meadow habitat and to sensitive plant occurrences within meadow habitats has been documented on the ENF. The miles of native surface routes within meadows provide a means of comparing potential effects to sensitive plant habitat among alternatives.

Environmental Consequences

The action alternatives (B-E) include a seasonal closure for native surface routes. Table 2-16, Comparison of Alternatives by Significant Issues and Indicator Measures, in Chapter 2 displays the length of the seasonal closure and the miles of routes closed under each alternative. Seasonal closures would reduce off-road impacts to sensitive plants and habitats located along these routes during the season when soils are most vulnerable to impacts from rutting, compaction and erosion (see soils section). These soil effects may translate into direct and indirect effects to sensitive plants occurring in the impacted soil. The miles of routes proposed for designation and length of seasonal closure vary by alternative.

Impacts to sensitive plants and their habitats vary across all alternatives and no alternative completely eliminates adverse affects to sensitive plants. In general, alternatives with fewer miles of routes open for public wheeled motor vehicle use show reduced effects to sensitive plants and their habitats.

A dramatic decrease in potential impacts to sensitive plants occurs when comparing any of the action alternatives against Alternative A (Table 3-F.5). The differences are less dramatic when comparing effects among the action alternatives (B through E). For example, 17% of known plant occurrences are affected in Alternative B and 10% in Alternative E.

Tables within the Biological Evaluation provide more specific and detailed comparison of effects among alternatives than presented by alternative here.

Table 3-F.5: Effects summary for sensitive plants, habitats, and noxious weeds

Measure		Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Number of plant occurrences1 and routes2 within 50 feet (direct and indirect effect)	Occurrence	45	21	18	20	16	11
	Routes	45	18	16	17	17	11
Number of additional plant occurrences and routes between 50 and 100 feet (indirect effect)	Occurrence	28	19	18	18	20	13
	Routes3	33 (23)	18 (10)	17 (11)	14 (8)	15 (8)	11 (7)
Total number of plant occurrences (NFS) within 100 feet of routes		73	40	36	38	36	24
Percent of known occurrences (NFS) within 100 feet of routes		30%	17%	15%	16%	15%	10%
Miles of roads within meadows4		14.9 (370 acres)	9.2 (228 acres)	4.1 (100 acres)	6.5 (161 acres)	8.5 (211 acres)	0
Number of routes through lava caps with known plant occurrences5		12 (23)	7 (18)	5 (16)	5 (16)	6 (17)	3 (13)
Miles of weed infested roads	Total	9.6	8.09	8.3	7.99	8.02	7.47
	ML 1, 2, 3	5.1	3.59	3.80	3.49	3.52	2.97

[1] Occurrences affected by more than one route were counted only once. Occurrences counted within 0-50 feet of a route were not counted again within 50-100 feet of route.

[2] Routes affecting more than one occurrence were counted only once. (For example, route 11N56A was counted once although it is within 50 feet of three occurrences (i.e., CACLA 80, NAPRL 60, and NAPRL 71).

[3] The first number is the total number of routes within 50 to 100 feet of occurrences. The number in parentheses is the number of unique, additional routes not already counted within 0 to 50 feet of occurrences.

[4] Includes trails, ML-1, and ML-2 routes.

[5] The number in parentheses is the number of routes through lava caps regardless of sensitive plant occurrences.

Only a few routes of any surface type are located within Special Interest Areas and Research Natural Areas for all alternatives (Table 3-F.6). The Biological Evaluation provides a breakdown of routes. The routes within the Round Top Botanical-Geological Interest Area for the action alternatives include Highway 88, an asphalt road west of the Pacific Crest Trail, and access to a trailhead. The routes within the Traverse Creek Botanical Interest Area for the action alternatives include two surfaced County roads (ELD-46 and ELD-47) and access to a trailhead. No routes within the analysis area are located inside the Rock Creek Botanical Interest Area; however, routes that are part of the Rock Creek Recreational Trail area occur within one portion of the Rock Creek Botanical Interest Area. Less than 110 feet of route (crushed aggregate or gravel and native surface) occurs within Peavine Point Research Natural Area. With the exception of Leonardi Falls Special Interest Area, no adverse effects are likely to these botanical resources under any action alternative.

Leonardi Falls Botanical Interest Area supports a unique combination of communities, springs, and sensitive plants. The hydrology of this area is critical to maintaining these special features. Approximately one-tenth mile of native surface route occurs in Leonardi Falls Botanical Interest Area in Alternatives B and C. Under Modified B and Alternatives D and E, no routes are proposed to be open to the public within the Leonardi Falls Special Interest Area, thereby eliminating potential adverse effects to these resources from motorized vehicles.

Table 3-F.6: Effects summary for Special Interest Areas and Research Natural Areas

	Miles of Routes					
Location	**Alt A**	**Alt B**	**Mod B**	**Alt C**	**Alt D**	**Alt E**
Botanical Interest Area						
Leonardi Falls Botanical	0.34	0.11	0	0.11	0	0
Rock Creek Botanical[1]	0	0	0	0	0	0
Round Top Botanical/Geological	0.76	0.75	0.75	0.75	0.75	0.24
Traverse Creek Botanical/Geological	1.09	1.06	1.06	1.06	1.06	1.06
Wright's Lake Bog	0	0	0	0	0	0
Total	2.19	1.91	1.81	1.91	1.80	1.30
Research Natural Area						
Peavine Point	0.02	0.02	0.02	0.02	0.02	0.02
Snow Canyon	0	0	0	0	0	0
Station Creek	0	0	0	0	0	0

[1] Routes in the Rock Creek Recreational Trail area that are located within one portion of the Rock Creek Botanical Interest Area are not within the analysis area.

Direct Effects for All Alternatives

The typical vegetation associated with habitat for a majority of the documented ENF sensitive plant occurrences consists of low growing shrubs and/or herbaceous plants in areas of sparse or widely spaced trees. Meadow and riparian areas also provide habitat for documented ENF sensitive plant occurrences. The types of associated vegetation and their distribution are important characteristics for this analysis both because of the role that vegetation plays in stabilizing the soil and its ability, or inability, to deter expansion of vehicular use. Vehicles can easily gain access into areas with low plant cover (i.e. lava caps, low chaparral, granitic and volcanic "balds", and meadows), and larger sized four-wheel vehicles have broken "trail" through natural shrub barriers as tall as 8 feet to gain access to selected local areas (ENF Sensitive plant files). Areas with larger or denser vegetation are also accessed along little-used or abandoned roads, utility corridors, skid trails and temporary logging roads, which typically are not open for public motor vehicle travel.

Direct effects to plants may be lethal. This occurs when individual plants are broken, crushed, or trampled by vehicles traveling or parking off of road surfaces. Off-road vehicles crush vegetation and root systems, killing seedlings and changing the composition of the forest (Cole and Bayfield 1993). Bisecting occurrences by both system and unauthorized routes often cause direct effects to sensitive plants. Plants themselves are often killed and habitat is permanently altered. Several sensitive plant sites are bisected by motor vehicle routes (ENF 2007).

In Alaska, habitat disruption resulting from off-road vehicle use and trampling are currently the greatest human-caused threat to *Botrychium* species (moonworts). Several *Botrychium* species occupy sandy beach-meadow habitat, and this habitat is used by an increasing number of off-road vehicles, resulting in *Botrychium* habitat degradation. In areas of high off-road use, many sensitive plant species have the potential to go locally extinct (Stensvold 2000). Yosemite moonwort (*Botrychium simplex*), an ENF watchlist species, occurs in a large meadow complex on the Pacific Ranger District. This meadow has been impacted by off-road vehicle-use for many years. Attempts to block access using downed trees were only temporarily successful. The district recently completed a restoration project that blocked and obliterated routes leading to the meadow, which may provide the protection needed for its recovery.

Other, less than lethal, direct effects may occur to sensitive plants when branches or flowering stems are crushed or broken by off-road vehicles. This damage reduces the reproductive and photosynthetic capacities of plants. Repeated damage of this type weakens the compensatory capabilities of sensitive species and other native plants, which can lead to the degradation of habitat and eventually to the replacement of native plant species with non-native species more adapted to frequent disturbances, such as invasive weeds.

Indirect Effects for All Alternatives

Impacts to soil from repeated off-road use lead to the degradation of habitat for sensitive plants and other native plant communities. Compaction by vehicles contributes to roadside invasions of exotic plant species by reducing native plant vigor and creating areas of competition-free space that are open to invasion (Frenkell 1970). Thus, plant communities adjacent to more improved roads (e.g., paved, gravel) that receive high vehicle traffic might be expected to be more invaded than those adjacent to infrequently used primitive roads (e.g., four wheel-drive tracks) (Parendes and Jones 2000).

Extensive studies have been made on the effects of strength of soil, bulk density, and soil moisture on the growth of crop plants. Considerable emphasis is placed on the importance of soil strength reducing root extension (Taylor and Bruce 1968; Taylor and Gardner 1963; Taylor and Burnett 1964; Taylor and Ratliff 1969; Barley et al. 1965; Lowry et al. 1970; Grimes et al. 1972: Voorhees et al. 1975) and emergence of seedlings (Arndt 1965: Taylor 1971). However, increased bulk density accompanied by decreases in soil moisture and air also retard growth of roots (Veihhmeyer and Hendrickson 1948; Taylor and Gardner 1963; Taylor and Ratliff 1969: Lowry et al. 1970: Voorhees et al. 1971).

Marked changes in the physical and chemical properties of soil have important implications for the biologic productivity of the land, its vulnerability to erosion, and the spread of damage to areas not directly impacted (Wilshire et al. 1977). These impacts to soil (from repeated off-road use) can cause soil compaction, erosion, loss of soil moisture, slower water infiltration rates, and even changes in soil temperatures. Soil compaction inhibits plant growth. In sensitive plant habitat, soils subjected to vehicular traffic that become compacted and eroded due to wheel ruts would likely become unsuitable for seedling development and the sustainability or expansion of that sensitive plant population. In studies of off-road vehicle use in natural areas around the San Francisco Bay Area, increases in bulk density of soils (measure of compacted soil) caused by vehicular use average about 8 percent for sandy soil and 18 percent for silty and clayey soils. Increased bulk density generally occurs to a depth of 30 cm (~12 inches) and has been observed in places at depths of 90 cm (~35 inches) or more (Wilshire et al. 1978). With repeated vehicular passes, the compressive stresses are generally transmitted to deeper soil layers.

Alternative A allows cross country travel off of routes, and thus poses the greatest risk to native and sensitive plant species for the reasons listed above. All action alternatives restrict vehicles to routes and parking within one vehicle length of routes open to public motorized-vehicle use. Prohibition of cross-country travel and limiting the area for parking vehicles would limit the extent that native and sensitive plants would be impacted under the action alternatives.

All action alternatives propose seasonal closures during the wettest part of the year. Under these restrictions, motor vehicle use would be limited to NFS ML-3, -4 and -5 roads during the dates proposed (see Table 2-20 in Chapter 2). Additional closures may be implemented by the responsible officials based on road conditions. These restrictions would likely provide a beneficial effect to sensitive plants and habitats, located on ML -2 and -1 roads and along motorized trails by restricting travel on native surface routes during the wettest season when soils are most prone to rutting, compaction, and erosion.

Meadows are particularly susceptible to compaction due to the fact that most meadows remain wet into August, with many staying wet year-round. Routes that pass through or along edges of meadows cause long-term adverse impacts to sensitive plant habitat. These impacts include loss of vegetation, streambank disturbances, accelerated erosion, and soil compaction. Soil compaction can influence drainage patterns as well as cause ruts in these well-defined soils. In either case, water infiltration into meadow soils is slowed or drainage patterns altered. These effects can change the type of vegetation occurring in disturbed portions of a meadow from the desired native grasses and sedges to an early seral type of vegetation, potentially non-native invasive plant species. Once established, many invasive plants tend to form monocultures which exclude/replace native plant species, including sensitive species.

Cumulative Effects for All Alternatives

The geographic scope of this cumulative effects analysis includes NFS lands within the boundaries of the Eldorado National Forest. This geographic scope was selected because impacts to sensitive plants and noxious weeds accumulate at a given location on the ground, irrespective of actions in surrounding areas. The temporal scope includes historic effects from grazing and mining activities that occurred as early as 1850, as well as effects from more recent past, present and future activities. This time period was selected because impacts to plants can accumulate over time.

It is recognized that a critical step in cumulative effects analysis is to compare the current condition of the resource and the projected changes (due to management activities) within the natural variability of the resource and processes of concern. This is difficult to determine for sensitive plants since long-term data for these species is most often lacking. Many sensitive plant habitats have a long history of disturbance (impacts from grazing and mining activities began in the mid 1800's) and an undisturbed reference is often lacking. Minimizing on-site changes to sensitive plants (and their habitat) may be the most effective way of reducing cumulative impacts. If one can minimize the adverse effects at the local scale, it follows that there would be a reduced potential for larger-scale effects (MacDonald 2004).

Flagging and avoiding sensitive plants is the most frequently used management strategy for reducing cumulative impacts to known occurrences. While flag-and-avoid management is effective in reducing cumulative impacts in most projects, it is not a practical mitigation for this project. Educational signage may help minimize impacts especially if utilized prior to a site becoming a "destination" location. Installing barriers along access routes to plant sites that experience repeated impacts from off-road vehicles is expensive but can be effective for excluding larger motor vehicles (i.e. 4 wheel drive trucks) but is less effective in keeping motorcycles or ATVs out of plant sites. Therefore alternatives that reduce opportunities for adverse effects are preferable to alternatives that do not (i.e. fewer routes overall or fewer routes in sensitive areas).

The cumulative effects analysis for sensitive plants considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: past, present, and future management activities.

Past Management Activities: Within the known range of the sensitive plant species known to or suspected to occur within the analysis area, the number of occurrences and amount of suitable habitat that have been adversely affected by previous management activities and programs on private and federal lands has not been fully tabulated, but has been of consequence. For instance in the past decade alone approximately 10 percent of this Forest (57,500 acres) has undergone timber/fuels reduction activities (Appendix E), and while direct effects to sensitive plant species from disturbances caused by these activities has been largely mitigated by avoidance, indirect effects such as further invasion by noxious weeds has occurred. Given the magnitude of the disturbance involved in various activities during the past 150 years, it is likely that historic fire suppression, road and trail construction (designed and unauthorized routes), campground construction, other types of recreation activities including OHV use, timber management, salvage activities, reforestation practices, historic grazing and mining activities, and hydroelectric development have degraded suitable habitat. It is also likely that individual sensitive plants have been destroyed by these activities and that entire occurrences have been eliminated.

Present and Foreseeable Management Activities: Cumulative effects for sensitive plant species include current (and past) impacts from all system and unauthorized routes included in Alternative A. These effects are combined with present and foreseeable future actions and events including soil disturbance from logging and other fuels treatments, the Rock Creek OHV trail system (where four occurrences of Parry's horkelia have been affected by roads or OHV trails), wild fire suppression activities, fire salvage logging (USFS and private industry), emergency BAER treatments, reforestation activities including proposed vegetation release treatments (mechanical, manual, and chemical), montane meadow grazing, road construction and maintenance, existing road conditions, and existing and anticipated noxious weed infestations and control treatments (see Appendix E for specific information) within the described analysis area.

Future Management Activities: Cumulative effects to sensitive plants and their habitats must also presume a continued increase of motorized recreation. A recently released State Fuel Tax Study (California Department of Parks and Recreation 2006) states that annual registration for non-street-licensed vehicles increased by 112 percent during the time period from 2001 to 2006. For the purposes of this effects analysis, potential for impacts to sensitive plant habitats is expected to increase at rates similar to the increase in use of off-road vehicles. An increase in the number of OHVs using a smaller system of open routes that traverse sensitive plant habitats in accessible landscapes (i.e. lava caps and meadows) is likely to cause an increased level of damage to these habitats and associated plants. Educational signage and other informational opportunities (i.e. enhanced media coverage, Tread Lightly signage) coupled with monitoring and adequate enforcement efforts, can help mitigate potentially increased impacts to these habitats.

Monitoring

Monitoring would occur in areas of the Forest where concentrated numbers of sensitive plant sites are located along open routes (see Biological Evaluation in the Project Record). These areas have the greatest potential for adverse effects from motor vehicles. Sites monitored may vary year to year. If impacts to a sensitive plant site are documented, the site would be signed to indicate the presence of a sensitive resource. This signage accompanied by an increase in monitoring may eliminate the inappropriate motorized vehicle use. If impacts continue, further actions to dissuade motorists from driving off-road would be implemented including installation of barriers along the boundary of the habitat being impacted.

Alternative A

Direct and Indirect Effects

As discussed in the Biological Evaluation, this alternative would have the greatest impact to sensitive plant communities with potential direct and indirect effects to approximately 30 percent of all ENF documented sensitive plant occurrences within the analysis area and potential indirect effects to their habitat. Adverse effects have been documented to the greatest number of plant occurrences. Alternative A has the greatest mileage within meadows. Alternative A also has the greatest mileage of weed infested routes with 5.1 miles of infestations along ML-1, ML-2, and native surface ML-3 routes being analyzed.

Indicator Measure 1: This Alternative has the greatest impact on sensitive plant species and habitats. Direct and indirect effects may occur to 45 sensitive plant occurrences located within 50 feet of 45 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 28 plant occurrences located within 50 to 100 feet of 33 routes. Combined, this Alternative may have direct and/or indirect effects to 30 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 73 sensitive plant occurrences along 68 routes. Alterative A contains 500 miles of unauthorized routes that may cause direct and indirect effects to <u>undocumented</u> sensitive plants, as well as sensitive plant habitats; however, more surveying is required to determine the impact these routes may have on sensitive plant species.

Indicator Measure 2: About 27 percent of the 73 plant occurrences along analyzed routes in Alternative A have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Five occurrences of Kellogg's lewisia have been adversely affected by vehicle traffic or dispersed camping. Because habitat for this species consists of granitic and volcanic balds, which after a brief season of growth and flowering (approximately 2-3 months) appears to be devoid of vegetation, it is easily made into a parking or camping site.

- Two occurrences of El Dorado manzanita are impacted by routes. One occurrence of El Dorado manzanita has been directly affected by unauthorized routes and general motor vehicle travel. At one site, 10 percent of the population and habitat has been lost to unlawful hill climbing activities since 1999. One other El Dorado manzanita site is directly adjacent to an unauthorized route. This species grows on a hard slate substrate that supports little vegetation other than this dwarf manzanita.
- Four occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.
- Five occurrences of yellow bur navarretia are adjacent to routes.
- Two occurrences of Parry's horkelia are bisected by routes.
- Two of three documented subalpine fireweed occurrences have been directly affected by a route.

Indicator Measure 3: Twelve of 23 native surface routes within documented lava caps (an ENF watchlist community) have known sensitive plant occurrences. Alternative A has the greatest number of routes in lava caps.

Indicator Measure 4: There are 14.9 miles of routes through meadows (habitat for several sensitive plant species). Based on the assumption that suitable habitat exists along routes in meadows and riparian areas, 370 acres of habitat for 11 sensitive plant species (four mosses, one lichen, five moonworts, and subalpine fireweed) may be adversely affected by routes open for public wheeled motor vehicle use through meadows.

Cumulative Effects

Overall, adverse cumulative effects to sensitive plant species from Alternative A are not expected to be of the scale that would reduce species viability for two of the most affected species. Both Pleasant Valley mariposa lily and yellow bur navarretia are endemic to El Dorado County. There are 116 known occurrences of Pleasant Valley mariposa lily and 56 known occurrences of yellow bur navarretia documented on the ENF, with another 12 Pleasant Valley mariposa lily and 27 yellow bur navarretia occurrences located on adjoining private land. At least 60 percent of known occurrences are unlikely to be adversely affected from public wheeled motor vehicle use due to inaccessibility factors. It is the opinion of the Forest botanist that cumulative effects from past, present, and foreseeable future management activities, including those from motor vehicle impacts, would not result in a trend toward federal listing for Pleasant Valley mariposa lily (CNPS list 1B) or yellow bur navarretia (CNPS list 4).

A third vulnerable species, Kellogg's lewisia, has 13 occurrences documented on the ENF but has a larger range in California. This subspecies is known from at least 43 occurrences ranging from Madera County (Sierra NF) to Plumas County (Plumas NF), including 10 occurrences in Yosemite National Park (USDA FS 2006). The 13 Kellogg's lewisia occurrences on the ENF have an estimated 6,000 individuals. Four of the 13 occurrences have documented impacts from motor vehicles (a fifth occurrence is within 10 feet of an OHV route), and due to the proximity to routes and the extreme openness of the habitat (granitic and volcanic "balds") other occurrences are vulnerable to disturbances from motor vehicles. The four populations impacted on the ENF contain an estimated 1,500 plants, which is about 25 percent of the estimated total number. Due to the extended range of this taxon within the Sierra Nevada, the fact that this taxon was only recently listed as sensitive and surveys for it have not been extensive, cumulative effects on the

ENF from past, present, and foreseeable future management activities would not result in a trend toward federal listing for Kellogg’s lewisia (CNPS list 3).

Three occurrences of El Dorado manzanita have been impacted by vehicles traveling off of routes. Only six occurrences of this species exist on the ENF. The route which contained the occurrence with extensive impacts from motor vehicle use has been closed under an emergency order and none of the Action Alternatives would allow motorized vehicles on this route. Another El Dorado manzanita occurrence also is likely to be protected by not allowing use on this route. Therefore, cumulative effects from past, present, and foreseeable future management activities would not result in a trend toward federal listing for El Dorado manzanita (CNPS list 1B).

Parry’s horkelia, another vulnerable sensitive species, has 10 occurrences on the ENF, with 6 occurrences known from the Rock Creek OHV trail system. Three occurrences are bisected by routes and the other three occurrences are within 50 feet of routes. Damage to four occurrences of Parry’s horkelia has been documented within the Rock Creek OHV trail system. Several ENF occurrences are protected from off-road vehicles by habitat characteristics that include dense stands of white-leaf manzanita. However, individual plants within these occurrences are present along the edge of routes and are vulnerable to vehicle impacts. Parry’s horkelia is known from other Sierra Nevada locations with documented occurrences on NFS, BLM, and private lands in El Dorado, Amador, Calaveras, and Mariposa Counties. Cumulative effects from past, present, and foreseeable future management activities are not likely to result in a trend toward federal listing for this CNPS list 1B species.

Subalpine fireweed is known from only three occurrences on the ENF, all of which occur along one route that would allow motor vehicle use in all alternatives except Alternative E. This species seems to be restricted to the Sierra Nevada and surveys have occurred primarily within the past two years. The number of occurrences is increasing with survey effort. Cumulative effects from past, present, and foreseeable future management activities are not likely to result in a trend toward federal listing for this CNPS list 1B species

The other meadow-dwelling sensitive species include the moonworts, the hump-mosses, Bolander’s bruchia, Blandow's bog moss and the water-veined lichen. They are wide ranging species but none are numerous in California, and while many are far-ranging, some of these are thought to be in decline throughout their historic ranges (J. Shevock, pers comm., 1999). Even though cumulative effects have likely occurred to these meadow-dwelling sensitive species from past, present, and foreseeable future management activities on this forest, they are not likely to result in a trend toward federal listing for these wide-ranging species.

Implementation of Alternative A would not, over time, improve conditions for sensitive plants and their habitats as a result of continued public wheeled motor vehicle use. Impacts to sensitive plant occurrences and habitat have occurred in the past, are currently taking place, and are expected to increase in the foreseeable future due to the predicted increase in motor vehicle use on the ENF. Difficult access to many other habitats and occurrences will make impacts from motor vehicles unlikely in some areas of the forest. Monitoring of plant sites, signing and protection measures that will be implemented where monitoring shows continued impacts from off-road vehicles use, and compliance efforts from law enforcement personnel will limit the extent of impacts to the more vulnerable sensitive plant habitats. In alternative A, cumulative impacts to sensitive plants on the Eldorado NF are expected to remain below the threshold required to reduce the overall viability for these rare plant species.

Alternative B

Direct and Indirect Effects

As discussed in the Biological Evaluation, the impact to sensitive plant communities is similar among Alternatives B, Modified B, C, and D. Alternative B has potential direct and indirect effects to approximately 17 percent of all ENF documented plant occurrences within the analysis area and potential indirect effects to their habitat. Alternative B has the second greatest mileage within meadows, slightly higher than Alternative D. The mileage (3.6 miles) of weed infested ML-1, ML-2, and native surface ML-3 routes being analyzed is approximately the same as Alternatives C and D and barely less than Modified B.

Indicator Measure 1: Direct and indirect effects may occur to 21 sensitive plant occurrences located within 50 feet of 18 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 19 plant occurrences located within 50 to 100 feet of 18 routes. Combined, this Alternative may have direct and/or indirect effects to 17 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 40 sensitive plant occurrences along 28 routes.

Indicator Measure 2: Twenty-five percent of the 40 plant occurrences along analyzed routes in Alternative B have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Three occurrences of Kellogg’s lewisia have been directly affected by vehicle traffic or dispersed camping.
- One occurrence of El Dorado manzanita is directly affected by routes.
- Three occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.
- One occurrence of yellow bur navarretia is adjacent to a route.
- Two of three documented subalpine fireweed occurrences have been directly affected by a route.

Indicator Measure 3: Seven of 18 native surface routes within documented lava caps have known sensitive plant occurrences. Alternative B has the third greatest number of routes in lava cap, marginally greater than Modified B and Alternatives C and D.

Indicator Measure 4: There are 9.2 miles of routes through meadows in this Alternative and 228 acres of habitat for 11 sensitive plant species that may be adversely affected. This alternative has the second highest mileage open to motor vehicles within meadows and acres of meadow habitat affected of the six alternatives.

Cumulative Effects

Under Alternative B, cumulative effects would continue to impact sensitive plants and their habitat, especially in meadows, as described under Alternative A but in a manner that slows the damage incurred from motorized travel, mainly due to a reduction in miles of routes open for public wheeled motor vehicle use adjacent to habitat and the prohibition of cross-country travel. Monitoring and compliance efforts would serve to mitigate damage to many of the most vulnerable sites.

Modified B

Direct and Indirect Effects

As discussed in the Biological Evaluation, the impact to sensitive plant communities is similar among Alternatives B, Modified B, C, and D. Modified B has potential direct and indirect effects to approximately 15 percent of all ENF documented plant occurrences within the analysis area and potential indirect effects to their habitat. Modified B has the second lowest mileage within meadows, with approximately five miles. Modified B has the second greatest mileage (3.8 miles) of weed infested ML-1, ML-2, and native surface ML-3 routes being analyzed, which is slightly higher than Alternatives B, C, and D. Less than 0.1 mile of unauthorized or ML-1 routes proposed to be open under Modified B is known to be infested with noxious weeds.

Indicator Measure 1: Direct and indirect effects may occur to 18 sensitive plant occurrences located within 50 feet of 16 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 18 plant occurrences located within 50 to 100 feet of 17 routes. Combined, this Alternative may have direct and indirect effects to 15 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 36 sensitive plant occurrences along 27 routes. One non-system route proposed to be opened to the public is within 50 feet of a sensitive plant occurrence.

Indicator Measure 2: Approximately 28% of the 36 plant occurrences along analyzed routes have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Three occurrences of Kellogg's lewisia have been directly impacted by vehicle traffic or dispersed camping.
- One occurrence of El Dorado manzanita is directly impacted by routes.
- Three occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.
- One occurrence of yellow bur navarretia is adjacent to a route.
- Two occurrences of subalpine fireweed have been directly affected by routes.

Indicator Measure 3: Five of 16 native surface routes within documented lava caps have known sensitive plant occurrences. Modified B and Alternative C have the second lowest number of routes within lava caps.

Indicator Measure 4:.There are 4.1 miles of routes through meadows in this Alternative and 100 acres of habitat for 11 sensitive plant species that may be adversely affected. This is the second lowest mileage with meadows and acreage of meadow habitat affected of the six alternatives.

Cumulative Effects

Under Modified B, cumulative effects would continue to impact sensitive plants and their habitat, including impacts to meadows, but in a manner that slows the damage incurred from motor vehicles, mainly due to a reduction in miles of routes open for public wheeled motor vehicle use adjacent to habitat and the prohibition of cross-country travel. Monitoring and compliance efforts will serve to mitigate damage to many of the most vulnerable sites.

Alternative C

Direct and Indirect Effects

As discussed in the Biological Evaluation, the impact to sensitive plant communities is similar among Alternatives B, Modified B, C, and D. Alternative C has potential direct and indirect effects to approximately 16 percent of all ENF documented plant occurrences within the analysis area and potential indirect effects to their habitat. Alternative C has the fourth greatest mileage within meadows, after Alternatives A, B, and D. The mileage (3.5 miles) of weed infested ML-1, ML-2, and native surface ML-3 routes being analyzed is approximately the same as Alternatives C and D and barely less than Modified B.

Indicator Measure 1: Direct and indirect effects may occur to 20 sensitive plant occurrences located within 50 feet of 17 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 18 plant occurrences located within 50 to 100 feet of 14 routes. Combined, this Alternative may have direct and indirect effects to 16 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 38 sensitive plant occurrences along 25 routes.

Indicator Measure 2: Approximately 26% of the 38 plant occurrences along analyzed routes have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Three occurrences of Kellogg's lewisia have been directly affected by vehicle traffic or dispersed camping.
- One occurrence of El Dorado manzanita has been adversely affected by routes.
- Three occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.
- One occurrence of yellow bur navarretia is adjacent to a route.
- Two subalpine fireweed occurrences have been directly affected by a route.

Indicator Measure 3: Five of 16 native surface routes within documented lava caps have known sensitive plant occurrences. Modified B and Alternative C have the second lowest number of routes within lava caps.

Indicator Measure 4: There are 6.5 miles of routes through meadows in this Alternative and 161 acres of habitat for 11 sensitive plant species that may be adversely affected. This alternative has the fourth highest mileage open to motor vehicles within meadows and acres of meadow habitat affected of the six alternatives.

Cumulative Effects

Under Alternative C, cumulative effects would continue to impact sensitive plants and their habitat, especially in meadows, but in a manner that slows the damage incurred from motorized travel, mainly due to a reduction in miles of routes open for public wheeled motor vehicle use adjacent to habitats such as meadows and lava caps and the prohibition of cross-country travel. Monitoring and compliance efforts would serve to mitigate damage to many of the most vulnerable sites.

Alternative D

Direct and Indirect Effects

As discussed in the Biological Evaluation, the impact to sensitive plant communities is similar among Alternatives B, Modified B, C, and D. Alternative D has potential direct and indirect effects to approximately 15 percent of all ENF documented plant occurrences within the analysis area and potential indirect effects to their habitat. Alternative D has the third greatest mileage within meadows, after Alternatives A, and B. The mileage (3.5 miles) of weed infested ML-1, ML-2, and native surface ML-3 routes being analyzed is approximately the same as Alternatives C and D and barely less than Modified B.

Indicator Measure 1: Direct and indirect effects may occur to 16 sensitive plant occurrences located within 50 feet of 17 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 20 plant occurrences located within 50 to 100 feet of 15 routes. Combined, this Alternative may have direct and indirect effects to 15 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 36 sensitive plant occurrences along 25 routes.

Indicator Measure 2: Twenty-five percent of the 36 plant occurrences along analyzed routes have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Three occurrences of Kellogg’s lewisia have been directly affected by vehicle traffic or dispersed camping.
- One occurrence of El Dorado manzanita has been adversely affected by routes.
- Three occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.
- One occurrence of yellow bur navarretia is adjacent to a route.
- One subalpine fireweed occurrence has been directly affected by a route.

Indicator Measure 3: Six of 17 native surface routes within documented lava caps have known sensitive plant occurrences. Alternative D has the third greatest number of routes within lava caps, marginally greater than Modified B and Alternative C.

Indicator Measure 4: There are 8.5 miles of routes through meadows in this Alternative and 211 acres of habitat for 11 sensitive plant species that may be adversely affected. Alternative D has the third highest mileage open to motor vehicles within meadows and acres of meadow habitat affected of the six alternatives.

Cumulative Effects

Under Alternative D, cumulative effects would continue to impact sensitive plants and their habitat, including impacts to meadows, but in a manner that slows the damage incurred from motorized travel, mainly due to a reduction in miles of routes open for public wheeled motor vehicle use adjacent to habitat and the prohibition of cross-country travel. Monitoring and compliance efforts would serve to mitigate damage to many of the most vulnerable sites.

Alternative E

Direct and Indirect Effects

When compared to the other Alternatives, Alternative E would have the least impact to sensitive plant communities and their habitat (see Biological Evaluation). The potential for direct and indirect effects would be reduced to approximately 10 percent of known ENF plant occurrences within the analysis area. Alternative E has no open routes within meadows and the fewest routes in lava caps. Alternative E has the least mileage of weed infested routes with approximately 3.0 miles of infestations on ML-1, ML-2, and native surface ML-3 routes being analyzed. Alternative E is the most protective alternative for ENF botanical resources.

Indicator Measure 1: Direct and indirect effects may occur to 11 sensitive plant occurrences located within 50 feet of 11 routes open for public wheeled motor vehicle use. Indirect effects may occur to an additional 13 plant occurrences located within 50 to 100 feet of 11 routes. Combined, this Alternative may have direct and indirect effects to 10 percent of sensitive plant occurrences documented on NFS lands within the analysis area. Direct and indirect effects may occur to habitat surrounding 24 sensitive plant occurrences along 22 routes. No non-system routes proposed to be opened to the public are within 100 feet of known sensitive plant occurrences.

Indicator Measure 2: Approximately 29% of the 24 plant occurrences along analyzed routes have known impacts from motor vehicles either driving off-road, parking or camping off-roads (ENF 2007) or are likely to have impacts due to being within 10 feet of motorized routes.

- Three occurrences of Kellogg's lewisia have been directly affected by vehicle traffic or dispersed camping.
- One occurrence of El Dorado manzanita is directly affected by routes.
- Three occurrences of Pleasant Valley mariposa lily have been either bisected by routes or disturbed by dispersed camping near routes.

Indicator Measure 3: Three of 13 native surface routes occur within documented lava caps have known occurrences of sensitive plants. Alternative E has the least number of routes within lava caps.

Indicator Measure 4: This Alternative has no open routes through meadows making Alternative E the most protective of ENF meadow and riparian botanical resources.

Cumulative Effects

Alternative E will provide the maximum protection to sensitive plants and habitat. Cumulative effects would continue to impact sensitive plants and their habitat, but in a manner that slows the damage incurred from motor vehicle travel, mainly due to a reduction in miles of routes open for public wheeled motor vehicle use adjacent to habitat and the prohibition of cross-country travel. Habitats in meadows are best protected in Alternative E (no routes open for public use through meadows). Likewise, lava caps would receive the maximum protection in this alternative. Monitoring and compliance efforts would still be necessary to mitigate damage to the most vulnerable sites.

Determination of Effects

It is the determination of the Forest Botanist that Alternatives A-E in the Public Motorized Travel Management Plan:

Would have no effect on Threatened, Endangered, or Proposed plant species: Layne's butterweed (*Packera layneae*).

Would have no effect on the sensitive plant species: Lake Tahoe draba (*Draba asterophora* var. *asterophora*); Cup Lake draba (*Draba asterophora* var. *macrocarpa*); tripod buckwheat (*Eriogonum tripodum*); long-petaled lewisia (*Lewisia longipetala*); and saw-toothed lewisia (*Lewisia serrata*).

May affect individuals but are not likely to result in a trend toward federal listing for: three-bracted onion (*Allium tribracteatum*); El Dorado manzanita (*Arctostaphylos nissenana*); big-scale balsamroot (*Balsamorhiza macrolepis* var. *macrolepis*); upswept moonwort (*Botrychium ascendens*); scalloped moonwort (*Botrychium crenulatum*); common moonwort (*Botrychium lunaria*); Mingan moonwort (*Botrychium minganense*); mountain moonwort (*Botrychium montanum*); Bolander's bruchia (*Bruchia bolanderi*); Pleasant Valley mariposa lily (*Calochortus clavatus* var. *avius*); Mountain lady's slipper (*Cypripedium montanum*); subalpine fireweed (*Epilobium howellii*); Blandow's bog moss (*Helodium blandowii*); Parry's horkelia (*Horkelia parryi*); Hutchison's lewisia (*Lewisia kelloggii* ssp. *hutchisonii*); Kellogg's lewisia (*Lewisia kelloggii* ssp. *kelloggii*); three-ranked hump-moss (*Meesia triquetra*); broad-nerved hump-moss (*Meesia uliginosa*); yellow bur navarretia (*Navarretia prolifera* ssp. *lutea*); veined water lichen (*Peltigera hydrothyria*); and Stebbin's phacelia (*Phacelia stebbinsii*).

G. Noxious Weed Risk Assessment

Affected Environment

Noxious weeds are defined in Forest Service Manual (FSM) 2080.5 (USDA FS 1995) as "those plant species designated as noxious weeds by the Secretary of Agriculture or by the responsible State official. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of serious insects or disease, and being nonnative or new to or not common to the United States or parts thereof." FSM 2081.03 (USDA FS 1995) directs that the risk of introducing or spreading noxious weeds associated with a proposed action be determined when any ground disturbing action or activity is proposed. "For projects having moderate to high risk of introducing or spreading noxious weeds, the project decision document must identify noxious weed control measures that must be undertaken during project implementation."

Inventory – Known noxious weed distribution along roads

The state of the current data regarding weed and non-native infested routes within the ENF is limited. The current collected data consists of approximately 900 sites recorded as data points along roadsides, primarily recorded by ground-based methods, and not all routes have been surveyed. The information associated with each point, such as size of infestation or distance along a route, is often unknown. Remote sensing data provided the ENF with mapped locations of the noxious weed Scotch broom across the ENF. All data on known weed and non-native plant locations have been collected by botanists since 1999, documenting 9.6 miles of weed infested roadways.

A list of the most invasive weed species known to occur on the ENF includes the following: barbed goat grass (*Aegilops triuncialis)*, medusahead grass (*Taeniatherum caput-medusae*), cheat grass (*Bromus tectorum*), Italian thistle (*Carduus pycnocephalus*), spotted knapweed (*Centaurea maculosa*), yellow starthistle (*Centaurea solstitialis*), rush skeletonweed (*Chondrilla juncea*), Scotch broom (*Cytisus scoparius*), Himalayan blackberry (*Rubus discolor*), and tall whitetop (*Lepidium latifolium*). Most of these species have been found growing along roadsides. Yellow starthistle and Scotch broom are by far the most common species found along ENF roads (ENF weed database 2007).

Both Scotch broom and yellow starthistle occur over comparatively large areas on the ENF. Aerial mapping by the USFS Remote Sensing Lab in 2005 provided the ENF with mapped locations of about 1,700 acres of Scotch broom infestations within ENF boundaries. On the ENF, this invasive shrub is found predominately on the Georgetown Ranger District, although Scotch broom exists in smaller patches on the other three ranger districts. Ground mapping of yellow starthistle infestations indicates that over 200 acres of infestation exists on the Placerville and Pacific Ranger Districts (Cleveland Fire Area), with smaller infestations, mostly roadside, on the Amador Ranger District and additional infestations on the Georgetown Ranger District. To a lesser extent, several other invasive plants (noted above) occur on the ENF, again mostly along roads.

Exotic grasses, such as cheatgrass (*Bromus tectorum*), and forbs, such as knapweeds (*Centaurea* species), have invaded over 50 million hectares of the region (western U.S.), reducing biodiversity by displacing native plants and animals (Mack 1989; Billings 1990; USDI BLM 1999).

Habitat Vulnerability and Vectoring Methods

Road shoulders are particularly susceptible to weed invasion. Road construction and maintenance activities mix soil layers, increasing soil microbial activity. Weeds exploit these newly available nutrients efficiently (Best et al. 1980, Belcher and Wilson 1989). This may be one reason that the density of weedy plants increases as the intensity of soil disturbance increases (Jensen 1995). Parendes and Jones (2000) found that the presence of exotic plant species was highly correlated with sunlit soil and frequent, severe disturbances, such as those resulting from road traffic and road maintenance activities such as grading.

Compaction by vehicles contributes to roadside invasions by reducing native plant vigor and creating areas of competition-free space that are open to invasion (Frenkell 1970). Thus, plant communities adjacent to more improved roads (e.g. paved, gravel) that receive high vehicle traffic might be expected to be more invaded than those adjacent to infrequently used primitive roads (e.g. four wheel-drive tracks) (Parendes and Jones 2000).

Road corridors are also prolific sources of weed seeds that may be carried to other locations (Tyser and Worley 1992) or that may colonize adjacent vulnerable habitats. Vehicle undercarriages can trap and transport weed seed (Sheley and Petroff 1999). A study in Kakadu National Park in Australia found that weed seed was transported into the park on tourist vehicles and was more likely to be transported by four-wheel-drive vehicles that had been driven off-road (Lonsdale and Lane 1994). A review of literature shows that native plant cover and species diversity increase with distance from routes, while the presence of exotic species declines with increased distance from road across many different parts of the world including California (Gelbard and Harrison 2003; Tyser & Worley 1992; Frenkell 1970; Johnson et al. 1975).

A number of mechanisms have been proposed as explanations for these patterns. Vehicles and road-fill operations transport exotic plant seeds into uninfested areas, and road construction and maintenance operations provide safe sites for seed germination and seedling establishment (Schmidt 1989; Lonsdale and Lane 1994; Greenberg et al. 1997; Trombulak and Frissell 2000). Clearing of vegetation and soils during construction, addition of roadfill, and grading of native surface roads create areas of bare and deeper soil that allow exotic seeds to become established (Frenkell 1970; Trombulak and Frissell 2000).

In addition to seed, vegetative propagules such as plant root fragments, stolons (runners), and stem fragments can spread weed infestations. Species such as rush skeletonweed, leafy spurge, purple loosestrife, kudzu, and all varieties of hawkweed can be transported vegetatively. Plant parts moved about during road maintenance can spread weed infestations nearly as effectively as seed (Ferguson et al. 2003).

Assumptions

For the purpose of this analysis, unless indicated in the data, each “point” of infestation along a route was assumed to be 50 feet in length. This assumption is based on 1) the fact that more than half of the weed data are five years or older and 2) application of a conservative rate of average weed spread along a disturbed road-side, especially with occasional road maintenance.

Indicator Measure

Risk Indicator Measure: Total number of road miles infested with noxious weeds by road maintenance level and by alternative.

Anticipated Weed Response to Alternatives

The range of effects (Table 3-G.1) between the alternatives is not dramatic, due mostly to relatively low miles of weed infestations.

Within the ENF a total of documented road weed infestations is 9.6 miles, with 5.1 miles occurring along ML-1, -2, and native surface -3 roads (out of a total of approximately 1,600 miles of these lower maintenance level routes). While this mileage does not represent a total inventory of weeds, roadside or otherwise, it does include the routes with the most extensive roadside infestations on NFS roads.

It is important to note that the ENF database of noxious weeds does not track all invasive weed species, it does track those species considered the most invasive by a consensus of botanists in this Region. For instance, with a few exceptions, exotic European grasses are not tracked. These species are rapidly moving along lower elevation forest roads, and due to very effective vectoring mechanisms are spread by people and other animals as well as vehicles and road maintenance activities. Tracking may be forthcoming but, due to their wide distribution, extremely rapid expansion rate, and lack of effective control measures, these species are the most difficult to track and contain.

A very small number of routes make up the majority of the infested miles. About 60 percent of the mileage is in two areas of highly concentrated presence where the weeds have become established over periods of 15 to 60 years. In the two areas infestations consist mainly of two species of invasive plants, Scotch broom and yellow starthistle. The first heavily infested area is on the Georgetown District in the Bottle Hill / Little Bald Mountain area. Here two Scotch broom infested routes – 13N58 (including spurs) and 13N93 (including spurs) – account for 1.3 miles or 25 percent of the total infested routes under analysis. On the Placerville and Pacific Districts, one route - 11N38 (Weber Mill Road and its spurs) – accounts for 1.6 miles (33 percent) of the roadside weed infestation being analyzed. This road bisects the 1992 Cleveland Fire area where the Forest's yellow starthistle infestation began in the early 1990s. All alternatives in the Final EIS allow use on portions of 11N38 and 13N58 / 13N93; Alternative E does reduce by half the mileage open along one of these routes, 13N58.

Alternative A has the greatest number of miles of infested roadside, with 5.1 miles of infested roadside within the ML-1, -2, and -3 roads being analyzed. Alternatives B, Modified B, C, D, and E have fewer miles of infested roadside (Table 3-G.1) with Alternatives B, C, and D having virtually the same number of infested miles. The greatest difference in miles of infested roadside exists between Alternative A and Alternative E (2.1 miles or 41% reduction for total infested native surface roads in analysis). Comparing only the action alternatives (B – E), Modified B has the most miles of weeded roadside and Alternative E has the fewest miles of weeded roadside. Infested mileage differs by 0.8 mile or an increase of 27% from Alternative E to Modified B. Non-system routes that are proposed to be opened to the public under Alternative E and Modified B account for 500 feet and less than 0.1 mile, respectively, of roadside infestations.

Table 3-G.1: Number of road miles infested with noxious weeds by road maintenance level and by Alternative

Maint Level Road	ALT A Miles	ALT B Miles	Mod B Miles	ALT C Miles	ALT D Miles	ALT E Miles
1	1.7	0.8	0.8	0.7	0.8	0.3
2	3.3	2.7	2.9	2.7	2.6	2.6
3	0.1	0.1	0.1	0.1	0.1	0.1
4	2.0	2.0	2.0	2.0	2.0	2.0
5	2.5	2.5	2.5	2.5	2.5	2.5
ML 1, 2, 3 [1] (TOTAL)	5.1 (9.6)	3.6 (8.1)	3.8 (8.3)	3.5 (8.0)	3.5 (8.0)	3.0 (7.5)

[1] ML-1, -2, and native surface ML-3 routes

One route, 11N38, includes 1.4 miles of roadside that is infested with at least four aggressive weed species. This route represents 28% of the entire infestation among the ML-1, -2, and -3 roads being analyzed. Excluding this route from designation would decrease the infested mileage for Modified B from 3.8 to 2.4 miles for an overall reduction of 37%. The difference in miles of infested roadside between Alternative A and Modified B would be 2.7 miles (53% reduction for total infested ML-1, ML-2, and native surface ML-3 roads in analysis).

Based on the miles of infested roadside, the risk of weed vectoring by motor vehicles and equipment is greatest in Alternative A, followed in decreasing order by Modified B, and Alternatives B, D, C, and E. The risk of vectoring weeds varies with location in the analysis area. Risk is high along routes with existing infestations, especially when the adjacent habitat is open with little canopy cover. Risk reduces to low where routes are distant from infestations and have high canopy cover.

Mitigation measures are limited. Standard project prevention measures (e.g., equipment and vehicle washing before entering uninfested areas) are not applicable under travel management. Mechanical treatments of noxious weeds are labor intensive and expensive, require many years of repeated treatment, and are impractical for the amount of infestation. Chemical treatments have been limited primarily to spotted knapweed in the South Fork Silver Creek Riparian Conservation Area and to yellow starthistle on approximately 250 acres within the analysis area. Unless an environmental analysis is approved for chemical treatment of invasive species, the risk of spreading noxious weeds will remain high within and adjacent to infested areas.

While noxious weeds (invasive plant species) may cause direct effects to sensitive plants through competition, noxious weeds have dramatic effects on potentially sensitive habitats. Noxious weeds also reduce species diversity in natural habitats across the analysis area.

Effects from noxious weeds will continue to occur regardless of which alternative is selected. Alternatives with fewer routes open for public wheeled motor vehicle use, especially those that exclude routes currently weed infested, provide a reduced risk for vectoring of seeds by motor vehicles, and may decrease the spread of weeds to uninfested portions of these routes and other parts of the forest.

H. Wildlife Introduction

Affected Environment

The ENF provides habitat for over 300 species of birds, mammals, amphibians, reptiles and fish (ENF LRMP, Appendix H, Wildlife Species List). Current management direction is guided by the Endangered Species Act (ESA) of 1973, the National Forest Management Act, (NFMA) and implementing regulations (CFR 219.19), the ENF LRMP (as amended), and local Habitat and Deer Herd Management Plans.

Several species found on the ENF are listed as Endangered or Threatened under the ESA, or have been designated by the Forest Service, Region 5, as sensitive to management activities ("sensitive species") (Table 3-H.1). These species and their habitats on the ENF are described in detail in a Biological Assessment (BA) or Biological Evaluation (BE) prepared for this project.

Management Indicator Species (MIS) were identified in the Eldorado NF LRMP to represent the diversity of vegetation and special habitat components on the ENF (Table 3-H.1). Forest Habitat goals and objectives were identified for MIS, standards and guidelines were developed to be applied to direct management, and forest-scale monitoring was planned to assess effects. Through this process, it is assumed that habitat conditions are maintained to sustain the diversity of forest wildlife species. The habitat status for each of these MIS is described in an MIS Report prepared for this project (see project record).

Table 3-H.1: Wildlife and Fish species with special management status on the ENF

[S=Forest Service Sensitive; MIS=Management Indicator Species; T= Federally Threatened]

Species	Status
Mammals	
Pacific fisher	S, Federal Candidate
American marten	S
Sierra Nevada red fox	S
California wolverine	S
Pallid bat	S
Townsend's big-eared bat	S
Western red bat	S
Mule deer	MIS
Black bear	MIS
Birds	
American bald eagle	S, MIS
American peregrine falcon	S, MIS
California spotted owl	S, MIS
Northern goshawk	S, MIS
Great gray owl	S
Willow flycatcher	S, MIS
Mountain quail	MIS
Cavity-nesting birds	MIS
Reptiles and Amphibians	
Western pond turtle	S
California red-legged frog	T
Foothill yellow-legged frog	S
Mountain yellow-legged frog	S, Federal Candidate
Yosemite Toad	S, Federal Candidate
Fish	
Trout	MIS
Invertebrates	
Valley elderberry longhorn beetle	T

Terrestrial wildlife and aquatic wildlife will be discussed individually in the following sections.

I. Terrestrial Wildlife

Literature describing the effects of motorized roads and trails upon wildlife have often grouped or categorized species in various ways to describe effects (Knight and Gutzwiller, ed. 1995, Gaines et al. 2003, Wisdom et al 2000). Gaines et al. (2003), categorized species into the following six groups based upon a combination of their biology and interactions with road- and motorized trail-associated factors:(1) old forest associated species; (2) wide-ranging carnivores; (3) ungulates; (4) riparian- associated species; (5) cavity dependent species; and (6) waterfowl. Threatened, Endangered, and Forest Service designated “sensitive species” (TES) and ENF MIS likely to be affected by motorized road or trail use, fall into these categories as shown below.

Old Forest Species
California spotted owl (MIS, S)
Northern goshawk (MIS, S)
Pacific fisher (S)
American marten (S)
Forest birds

Wide-ranging Carnivores
Black bear (MIS)
Sierra Nevada red fox (S)
California wolverine (S)

Ungulates
Mule deer (MIS)

Riparian Associated Species
Bald eagle (MIS, S)
Willow flycatcher (MIS, S)
Great gray owl (S)
Peregrine falcon (MIS, S)
Riparian birds
Valley elderberry longhorn beetle (T)

Cavity Dependent Species
Cavity nesting birds (MIS)
Pallid bat (S)

Waterfowl
No ENF MIS or TES species

The Townsend’s big-eared bat, and Western red bat are sensitive species that are not represented in any of the categories above and mountain quail is a MIS not represented in any of the categories above. Project effects upon these species evaluated in a BE and an MIS report prepared for this project did not indicate interactions with road or trail-associated factors.

Old Forest Habitats and Species

Late-successional forests are recognized as one of three Sierra Nevada ecosystems having suffered greatest reductions in extent, integrity and biodiversity (Graber 1996). Forest ecologists estimate that old forest conditions have declined by approximately 50 to 90 percent in the Sierra Nevada, depending on forest type, when compared to the range of historical conditions (USDA FS 2001a). Present forests differ from those pre-1850 conditions most significantly by: (1) a reduction of large trees and structural diversity within patches (local homogenization); (2) a loss of diversity among patches (landscape homogenization and simplification); and (3) a loss of continuity and distribution of old forests across the landscape (landscape gaps) (USDA FS 1998b). Land and Resource Management Plans for 11 national forests in the Sierra Nevada were amended in 2001 and 2004 with an objective to protect, increase, and perpetuate old forest ecosystems and provide for the viability of native plant and animal species associated with old forest ecosystems. Old Forest Emphasis Areas, Spotted owl and northern goshawk Protected Activity Centers, and Spotted Owl Home Range Core Areas are land allocations with specified “desired conditions” on the ENF, designed to improve and restore old forest habitats and species.

California Spotted Owl and Northern Goshawk

The California spotted owl and northern goshawk are MIS representing “old growth” and “late successional” forests, and are also a Sensitive Species on the ENF. Detailed information species’ habitat and population status for these species is provided in the ENF MIS Report (Eldorado

National Forest 2007), and in the MIS Report and BE prepared for this project (see project record).

In general, both species select habitat with old forest characteristics, including higher numbers of large trees and dense, multi-layered canopy cover for nest and roost locations. Sites selected for nesting, roosting, and foraging also contain higher numbers of snags and down logs than random sites. For mapping and analysis purposes, this habitat has been represented by CWHR 4M, 4D, 5M, and 5D size and density classes in most coniferous forest types (described more specifically in the Forest MIS report).

The ENF has conducted surveys for spotted owl presence and reproductive status within project areas since 1987. These surveys have covered the vast majority of NFS land within the ENF, especially during the early 1990s. Comprehensive surveys have occurred annually since 1987 within the 88,000 acre California Spotted Owl Demographic Study Area on the Georgetown and Pacific Ranger Districts. Based upon survey results since 1987, 201 spotted owl activity centers have been identified and the best available habitat is maintained as 300-acre Protected Activity Centers (PACs) for these owl sites, with guidelines and desired conditions specified in the ENF LRMP.

Surveys for goshawk presence and reproductive status have been conducted since the late 1980s, and those conducted after 2000 used the current Region 5 survey protocol. These surveys have occurred over much of the Forest, and over time, have identified 75 goshawk territories. Two hundred acres of nesting habitat is identified for each of these sites and managed as Protected Activity Centers (PACs) with guidelines and desired conditions specified in the ENF LRMP.

Forest-scale MIS habitat and population monitoring for California spotted owl and northern goshawk is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Management direction in the ENF LRMP for the California spotted owl and Northern goshawk that is applicable to this project is to, “Mitigate impacts where there is documented evidence of disturbance to the nest site from existing recreation, off highway vehicle route, trail, and road uses (including road maintenance). Evaluate proposals for new roads, trails, off highway vehicle routes, and recreational and other developments for their potential to disturb nest sites” (USDA FS 2004b). Allowing wheeled motor vehicle use on unauthorized routes or on NFS routes that were to be managed as closed (ML1 routes) is considered a proposal for a new road, trail or OHV route in this analysis.

American Marten and Pacific Fisher

American marten and Pacific fisher are sensitive species (the fisher is a candidate for listing under the ESA). Both are wide-ranging carnivores that are associated with old forest conditions. Fisher predominantly occur in mid-elevation coniferous forest, but appear to now be absent from the Central Sierra Nevada, including the ENF (Zielinski et al. 2005). Marten occupy habitat above 5,000 feet in elevation on the ENF, preferring red fir, lodgepole pine, and subalpine conifer forest types. Fisher and marten use large areas of primarily coniferous forests with fairly dense canopies and large trees, snags, and down logs. A vegetated understory and large woody debris appear important for both fisher and marten prey species. It is assumed that fisher will use patches of quality habitat that are interconnected by other forest types, whereas they will not likely use patches of habitat that are separated by large open areas lacking canopy cover (Buskirk and Ruggiero 1994). Similarly, marten have not been found in landscapes with greater than 25 percent of the area in openings (Hargis and Bissonette 1999; Potvin et al. 2000).

Riparian corridors (Heinemeyer and Jones 1994) and forested saddles between major drainages (Buck 1983) may provide important dispersal habitat or landscape linkages for fisher and marten.

Riparian areas are important to fishers because they provide important concentrations of rest site elements, such as broken top trees, snags, and coarse woody debris (Seglund 1995). For mapping and analysis purposes, fisher and marten habitat has been represented by CWHR 4D, 5M, and 5D and 6 size and density classes in coniferous and hardwood forest types, with marten habitat being mapped only above 5,000 feet in elevation.

Systematic surveys designed to detect the presence of fisher and marten occurred in the Sierra Nevada, including surveys on the ENF, between 1996 and 2002.. These surveys detected marten, but did not detect fisher on the Forest. Additional surveys have occurred within some project areas but have not been systematic or comprehensive. For purposes of this analysis, marten are assumed to occur within suitable habitats above 5,000 feet in elevation. Fisher are assumed to be absent from the Forest and from the Central Sierra Nevada in general, based upon available research and lack of detections.

Management direction in the ENF LRMP for fisher and marten that is applicable to this project is to, “Minimize old forest habitat fragmentation,” and “Assess the potential impact of projects on the connectivity of habitat for old forest associated species.” (USDA FS 2004b).

Coniferous Forest Birds

Under Executive Order 13186, migratory bird species are identified as a priority for planning efforts and for evaluating environmental effects in implementing the Migratory Bird Treaty Act. In the Sierra Nevada bioregion alone, 34 bird species depend critically on or substantially utilize late-successional/old-growth forests (Siegel and deSante 1999). Population trends for 13 of these species show decreasing tendencies, 7 species appear stable or have increasing tendencies; data are insufficient to detect trends for 14 others (Siegel and deSante 1999).

Wide-Ranging Carnivores

Carnivores are important indicators of ecosystem integrity in that they influence the structure and reflect the vigor of the prey species upon which they depend. Many large and mid-size carnivores are unique in their response to human-caused habitat changes due to their huge spatial requirements and their sensitivity to the effects of landscape patterns, including such factors as road and edge density (Buskirk and Zielinski 2003). While some mammalian carnivores, such as coyotes, have adapted to the presence of humans and human activities, for others, such as wolverine and Sierra Nevada red fox, human activities are documented or suspected to have significant adverse impacts (Claar et al. 1999, Grinnell et al. 1937).

Black Bear

The black bear is designated as an MIS on the ENF to represent downed logs, riparian habitats, meadows, hardwood forest, ponderosa pine forest, red fir forest, and lodgepole pine. Black bears prefer “fairly dense, mature stands of many forest habitats, and feed in a variety of habitats including brushy stands of forests, valley foothill riparian areas, and wet meadows. Cover requirements include large trees and various cavities and hollows in trees, snags, stumps, logs, uprooted trees, talus slopes, or earth dens. These habitat elements must be in mature, dense vegetation and on sheltered slopes for adequate denning” (Excerpt from CWHR 2005). Large undeveloped blocks of habitat where bears will encounter few humans in the core areas within these blocks are assumed to be important for black bears.

Monitoring of black bear on the ENF is conducted in partnership with CDFG. Black bear are routinely observed on the forest and Sierra Nevada populations are estimated to be increasing (CDFG 2004). Management direction in the ENF LRMP for black bear that is applicable to this project is to, “Maintain medium to high capability habitat in accordance with habitat capability models” (USDA FS 1989). Habitat capability models indicate high capability habitat is provided with road densities below 0.5 miles per square mile and moderate capability habitat is provided where road densities are below 5 miles per square mile. Forest-scale MIS habitat and population monitoring for black bear is summarized in the project MIS report and Eldorado MIS Report (see the project record).

California Wolverine and Sierra Nevada Red Fox

The wolverine and Sierra Nevada red fox are wide-ranging carnivores that use a variety of vegetation types but appear to select areas that are free from significant human disturbance. The wolverine has been placed in the smallest population size class of Sierra Nevada species, with the most significantly declining trend and the most significantly contracted range (USDA FS 2001a). Until 2008, the lack of recent (1961 to present) verifiable wolverine records in California led researchers to speculate that the wolverine population in California had been extipated (Aubry et al. 2007); a 2008 detection in the Central Sierra Nevada, however, indicates otherwise, though numbers are undoubtedly low. The current distribution and population status of the Sierra Nevada red fox is uncertain (CDFG 1990), but the relatively low number of recent sightings suggests a small, possibly declining population (USDA FS 2001a).

Both wolverines and Sierra Nevada red fox readily use non-forest habitat above timberline, but a significant portion of their life history needs are met in forests (Banci 1994). Wolverines that occur in forested areas use dense forest cover for travel and resting. The Sierra Nevada red fox also requires a composite of habitat types including open forests and meadows. Meadows are thought to be particularly important as foraging areas for the species (USDA FS 2001a). Both wolverines and Sierra Nevada red fox are known to avoid humans and human developments and are particularly sensitive to disturbance during the late winter and early spring denning period (Grinnell et al. 1937, Krebs et al. 2007). On the ENF, subalpine and alpine areas provide wolverine habitat and some of the only large areas with low human development or presence. Management direction for these species is to evaluate potential impacts through a Biological Evaluation and to ensure that management activities do not result in a trend toward listing or loss of species viability.

Ungulates

Mule Deer

Mule deer is identified as an indicator species to represent the condition of the following habitats and habitat elements on the ENF: riparian habitats, meadows, edge, hardwood forests, and early/mid-successional habitats.

Mule deer range and habitat on the ENF includes coniferous forests, oak woodland, shrubland, and meadows. Suitable habitat is composed of two distinctly different elements: cover and forage. Hiding cover is typically close to the ground and thick enough to camouflage the outline of the deer, without being so dense as to obscure the approach of potential predators. Thermal cover is similar and generally thought to be denser, with the additional property of sheltering deer from the elements. Foraging habitat occurs primarily in forest openings and meadows or sparser stands where shrubs and forbs are available. Hardwoods, such as oaks, are important for mast production, especially in winter range.

Most deer on the ENF migrate seasonally between higher elevation summer range and low elevation winter range, where they concentrate on south and westerly slope aspects typically identified as “critical winter range.” Fawning areas occur within summer range and are composed of low shrubs or small trees suitable for protection of the doe as she gives birth, and adequate for sheltering the fawn. Fawning areas must be interspersed with forage, hiding cover, and thermal cover for the doe.

The ENF provides a major portion of the ranges for four deer herds: the Blue Canyon, Pacific, Grizzly Flat, and Salt Springs herds (described in the Forest MIS Report, 2007). These herds have declined substantially from what are thought to have been artificially high numbers in the 1960s, but are presently thought to be stable or increasing (CDFG 2003, CDFG 1998). Forest-scale MIS habitat and population monitoring for mule deer is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Riparian Associated Species

Riparian areas are important to wildlife as sources of water, food (e.g. soft mast from deciduous trees and shrubs), cover, nesting habitat, favorable microclimates, and as corridors for migration. Riparian areas have been identified as the single most critical habitat for avian conservation across California (Riparian Habitat Joint Venture [RHJV]1998) and mountain meadows are particularly important habitats for many species and especially for birds in the Sierra Nevada (Graber 1996). The Sierra Nevada Ecosystem Project (SNEP) found that loss of riparian function was evident in mountain meadows throughout the Sierra Nevada (Kattelmann and Embury 1996).

Roads, and a number of other factors, were found by the SNEP to have substantially affected riparian areas throughout the Sierra Nevada; riparian areas lacking vegetation cover were usually associated with motor vehicle access. Among the 24 river basins studied in the Sierra Nevada, the Cosumnes and Mokelumne River basins were found to be most influenced by roads, based upon the proportion of these basins with roads within 100 meters of the stream (Kattelmann and Embury 1996). Forest Plans in the Sierra Nevada were amended in 2001 and 2004 to address concerns associated with the health of riparian and aquatic ecosystems, and Riparian Conservations Areas (RCAs) were established as 150 to 300 foot buffers along seasonal and perennial streams. Desired conditions have been identified for RCAs, and Riparian Conservation Objectives (RCOs) have been established. These are addressed more specifically in the Aquatic Wildlife and Hydrology Sections in this Chapter.

Riparian-Associated Birds

Under Executive Order 13186, migratory bird species are identified as a priority for planning efforts and for evaluating environmental effects of projects. In the Sierra Nevada bioregion, 53 species of birds depend critically on or substantially utilize riparian or meadow habitats (Siegel and deSante 1999). Focal species associated with riparian habitats include the black-headed grosbeak, song sparrow, warbling vireo, Swainson’s thrush, tree swallow, Wilson’s warbler, and yellow warbler (RHJV 2004). These species are strongly associated with a range of riparian habitats on the ENF, from lower elevation streamside zones to higher elevation meadows.

Meadows provide some of the most important habitat for neotropical migrants and resident landbirds in the Sierra Nevada, providing important stopover habitat for many species (Siegel and deSante 1999). Thirty-seven species critically depend on, or are strongly associated with Sierra montane meadows. Of these species, six are stable; 14 are decreasing; and four are increasing (13 are inadequately sampled by the BBS to allow the calculation of a population trend, but among these 13 are two California endangered species (willow flycatcher and great gray owl) and a California Bird Species of Special Concern (Vaux’s swift)). The preponderance of decreasing species is statistically significant. Riparian focal species that use meadow habitats include the song sparrow, yellow warbler, and Wilson’s warbler (RHJV 2004). Meadows also provide important habitat for the red-breasted sapsucker which is identified as a “Watch List” species in the Partners in Flight North American Landbird Conservation Plan.

Willow Flycatcher

The willow flycatcher is both a sensitive species and a MIS on the ENF, representing meadow and riparian habitats. Willow flycatchers breed in shrubby vegetation in meadow and riparian communities. Willow flycatchers are consistently associated with meadows, where high water tables resulting in standing water and riparian shrubs (specifically willow) are abundant.

Suitable habitat occurs on the ENF, but recent surveys of suitable habitat have located willow flycatchers at only one location (Indian Valley) in 2003 and 2004. The Willow Flycatcher Conservation Assessment identified meadow degradation, which can result in meadow drying, loss of nesting and foraging substrates, increased predator access to meadow interiors, and potentially cowbird parasitism, as among the key factors likely responsible for the serious decline of willow flycatcher populations.

Forest-scale MIS habitat and population monitoring for willow flycatcher is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Great Gray Owl

The Great gray owl is a Forest Service designated sensitive species and a State listed threatened species. Great gray owls use old forest habitat near openings, such as meadows. Old forests provide large diameter (over 50 cm. dbh) trees or snags having abandoned raptor nests for nest sites, and openings provide huntable populations of rodents (Verner 1994).

Suitable Great gray owl habitat occurs on the ENF, but breeding pairs have not been detected during the past two decades. A pair of Great gray owls utilized Leoni Meadows early in the breeding season in 2002 but did not remain after mid-June, and Great gray owls were found to have nested in 2006 on private land adjacent to the Forest. Coordinated inventories for Great gray owls have not been conducted on a large scale, and since these owls are somewhat secretive and difficult to detect, there is a possibility that they may occupy additional locations where there is suitable habitat. Some researchers have concluded that availability of suitable hunting meadows restricts population densities and range expansion in California (Hayward and Verner 1994). Height and cover of herbaceous vegetation has been found to correspond to higher vole populations that provide prey for great gray owls.

Bald Eagle

The bald eagle is a Forest Service designated sensitive species and a MIS selected to represent aquatic and riparian habitats. The bald eagle was listed by the Fish and Wildlife Service (USFWS) as a federally endangered species in 1978 and was removed from the list of Threatened and Endangered Species on June 28, 2007. Since 1978 populations have increased nationwide as well as in the Sierra Nevada and on the ENF (USDA FS 2007). Management direction for the bald eagle is now provided by the Bald and Golden Eagle Protection Act of 1940 and the Migratory Bird Treaty Act of 1972. Under these acts, disturbance that is likely to cause injury, substantial interference with normal breeding, feeding or sheltering behavior, or nest abandonment is prohibited (USDI Fish and Wildlife Service, 2007).

Bald eagles use habitat in proximity to major lakes and reservoirs on the ENF, both in summer and winter. Bald eagle nests are usually located in uneven-aged (multi-storied) stands with old growth components (Anthony et al. 1982). Most nests in California are located in predominantly coniferous stands. Nest sites typically occur within a mile of open water, and trees selected for nesting are characteristically one of the largest in the stand or at least co-dominant with the overstory.

On the ENF, both wintering and summer nesting surveys have occurred annually since the early 1980s. The number of nesting bald eagles has increased on the ENF over the past couple of decades from a single nesting pair in the mid-1980s to three nesting pairs documented on NFS lands, and an additional pair on private land within the ENF boundary in 2004. Wintering bald eagles use all major reservoirs on the Forest that remain unfrozen, with the number of individuals fluctuating from year to year. Mid-winter bald eagle surveys are conducted annually on the ENF and nest success is monitored annually at all known nest sites. Potential bald eagle nesting and wintering habitat has been mapped within a mile of the major lakes and reservoirs capable of supporting bald eagles.

National Bald Eagle Management Guidelines have been provided by the USFWS to advise land managers of the potential for various human activities to disturb bald eagles. Although the species is no longer listed as endangered, the Service strongly encourages adherence to these guidelines to ensure that bald and golden eagle populations will continue to be sustained (USDI Fish and Wildlife Service 2007). Forest-scale MIS habitat and population monitoring for bald eagle is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Peregrine Falcon

The peregrine falcon is a sensitive species and a MIS selected to represent cliffs, riparian areas, meadows, and water. The most commonly occupied habitats contain cliffs for nesting, with open gulfs of air (rather than in confined areas) and generally open landscapes for foraging. Peregrines forage upon many species of birds and sometimes mammals in a variety of open habitats. Meadows, riparian areas, or lakes may provide preferred foraging areas but are not essential (CWHR 2005).

On the ENF, 77 potential cliff nesting sites were mapped in a peregrine falcon nesting habitat survey completed in 1980 (Boyce and White 1980). These sites were ranked in relation to their suitability, and field information was collected for the most suitable cliff sites. Peregrine falcons were absent from the ENF for two decades prior to 2005, when a pair established an eyrie and successfully fledged young. Young have been fledged from this site during the past two breeding seasons, reflecting an increasing population trend on the ENF, as is occurring within other parts of the State.. Forest-scale MIS habitat and population monitoring for peregrine falcon is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Valley Elderberry Longhorn Beetle

The valley elderberry longhorn beetle is a threatened species under the Federal Endangered Species Act. The species range occurs below 3,000 feet in elevation, where potential habitat is provided by elderberry plants with stems larger than 1 inch diameter.

Below 3,000 feet in elevation, elderberry plants occur most commonly within broad riparian zones along the major rivers. On the Eldorado National Forest, potential habitat for elderberry was mapped as all areas below 3,000 feet in elevation with less than 20 percent canopy cover in trees. The ENF has approximately 5,000 acres of potential habitat, all along the west administrative boundary. Field surveys conducted within a sample of this potential habitat have not located elderberry plants nor has the species been detected on the forest.

Cavity Dependent Species Group

Many wildlife species depend on snags or dead trees for nesting, roosting, denning, foraging, resting, or shelter. Tree mortality can result from insect outbreaks, diseases, fire, drought, and flooding. Such events maintain the snag resource through time, though snag numbers may fluctuate as forests undergo cycles of drought accompanied by higher tree mortality, followed by lower tree mortality after stands have thinned (Bull et al. 1997).

Data collected from Forest Inventory Assessment (FIA) plots measured between 1998 and 2004 showed snag numbers varying across different vegetation types (Table 3-I.1). The Sierra Nevada Forest Plan Amendment provides the following general guidelines for snag retention, indicating that retention levels within individual projects must “sustain a continuous supply of snags and live decadent trees across the landscape, avoiding uniformity across large areas." (USDA FS 2004c, ROD p.51).

- Westside mixed conifer and ponderosa pine types – four of the largest snags per acre.
- Red fir forest types- six of the largest snags per acre.
- Westside hardwood ecosystems – four of the largest snags (hardwood or conifer) per acre.

Table 3-I.1 indicates that ENF LRMP guidelines for snags were being exceeded within the white fir, mixed conifer, and red fir types. Snag numbers were slightly below recommended retention levels in the ponderosa pine type.

Table 3-I.1: Average number of snags per acre within FIA plots (1998-2004)

Stratum	Diameter Class		
	15"-29.9"	30"+	Total
Sub alpine (3P)	1.23	0.62	1.85
White Fir (3N)	6.72	1.74	8.46
Lodgepole pine (3N)	1.07	0.80	1.87
Mixed Conifer (3N)	4.82	1.64	6.46
Ponderosa Pine(3N)	2.26	0.81	3.07
Red Fir (3P)	4.28	2.37	6.65

Cavity Nesting Birds

Dead trees (snags) are important to birds for a variety of reasons. Many birds require large snags (Vaux's swift) or dead trees (brown creeper, black-backed woodpecker) for nesting; others require downed wood or dead trees for foraging (pileated woodpecker). Olive-sided flycatchers require the presence of very tall, dead trees in their territories for perching.

The ENF LRMP identifies the assemblage of cavity nesting birds species as an indicator representing the condition of snags and snag habitat for many snag-dependent wildlife species. The hairy woodpecker, pileated woodpecker, Williamson's sapsucker, and red-breasted sapsucker are cavity nesting species for which specific monitoring requirements apply (USDA FS 2007). Forest-scale MIS habitat and population monitoring for cavity-nesting birds is summarized in the project MIS report and Eldorado MIS Report (see the project record).

Pallid Bat

Several bat species are identified as sensitive on the ENF, including the Townsend's big-eared bat, western red bat, and the pallid bat. Of these species, only the pallid bat uses snags as roost sites (see project Biological Evaluation). A substantial number of bat species that are not designated as sensitive are dependent upon snags for roosting habitat, but the pallid bat tends to be roosting habitat generalists, using many different natural and man-made structures (USDA FS 2001a). Tree roosting has been documented in large conifer snags and bole cavities in oaks (Orr 1954). Cavities in broken branches of black oak have been reported as being important to pallid bats in California, and there is a reported strong association with black oak for roosting (USDA FS 2001a). Pallid bats are very sensitive to roost site disturbance, and since they form roosting colonies, large numbers of bats may be affected by a single disturbance (Zeiner et al. 1990).

Analysis Framework

Background Information

Available literature indicates that public wheeled motor vehicle use of roads and trails affects wildlife, directly and indirectly, in a wide variety of ways. Although there is a considerable body of research describing effects of motorized roads and trails on wildlife, these interactions are complex, variable, and information gaps remain (Gaines et al. 2003, Trombulek and Frissell 2000, USDA Forest Service 1998). Road and trail-related effects can be categorized in a variety of ways; for this analysis they have been placed into the following three categories: effects resulting from human-caused mortality, effects resulting from changes in behavior, and effects resulting from habitat modification. Using a comprehensive review of the literature presented by Gaines et al. (2003), Table 3-I.2 lists and summarizes the types of road and trail-associated factors occurring within these categories and their effects upon groups of wildlife species. The following is a very general discussion of these factors and effects.

Table 3-I.2: Road- and trail-associated factors with documented effects on habitat or populations of wildlife species, and the affected wildlife species groups

Road- and Trail-Associated Factors		Effects of the Factors	Species Groups				
			Late Successional	Wide-Ranging Carnivores	Ungulates	Snag Dependant	Riparian Associated
Human-Caused Mortality	Collisions	Death or injury from a motorized vehicle running over or hitting an animal.	√	√	√		√
	Hunting/trapping	Mortality from hunting or trapping as facilitated by road and trail access.		√	√		
	Poaching	Increased illegal take of animals as facilitated by trails and roads.		√	√		
	Negative human interactions	Increased mortality of animals resulting from increased contacts with humans, as facilitated by road and trail access.		√	√		
	Collection	Collection of live animals (such as amphibians or reptiles) as facilitated by roads or trails or by access.	√				√
Changes in Behavior	Displacement or Avoidance	Spatial shifts in populations or individual animals away from human activities on or near roads or trails.	√	√	√		√
	Disturbance at a specific location	Displacement of individual animals from a specific location that is being used for reproduction and rearing of young.	√	√	√		√
	Physiological response	Increase in heart rate or stress hormones (which may decrease survivorship or productivity) when near a road or trail.	√		√		
Habitat Modification	Habitat loss and fragmentation	Loss and resulting fragmentation of habitat due to the establishment or use of roads or trails and associated human activities.	√	√	√	√	√
	Edge effects	Changes to habitat microclimates associated with the edge induced by roads or trails.	√				

Road- and Trail-Associated Factors		Effects of the Factors	Species Groups				
			Late Successional	Wide-Ranging Carnivores	Ungulates	Snag Dependant	Riparian Associated
	Snag or down log reduction	Reduction in density of large snags and downed logs owing to their removal near roads to remove hazards and as fuelwood.	√			√	√
	Route for competitors and predators	Providing access or greater hunting success for competitors or predators than would otherwise have existed.	√	√		√	√
	Movement barrier	Interference with dispersal or other movements due to either the road itself or by human activities on or near roads or trails.	√	√	√		√

Human-caused Mortality (collisions, hunting, trapping, poaching, negative human interactions, and collection): Death or injury from a vehicle hitting or running over an animal is well documented and affects the vast majority of terrestrial species, though to varying degrees (Trombulak and Frissell 2000). In general, road mortality increases with traffic volume and speed, and road kill on native surface forest roads is generally not significant for large mammals (USDA FS 1998). Small mammals and herptiles are more vulnerable because individuals are inconspicuous and slow-moving. Amphibians may be especially vulnerable to road mortality because their life histories often involve migration between wetland and upland habitats (Trombulak and Frissel 2000, USDA FS 1998). Raptors are also be vulnerable to collisions on forest roads due to their foraging behaviors, but the most substantial documented mortality has been along highways.

Roads and motorized trails open areas to increased poaching or illegal shooting and losses from incidental trapping. These factors can be substantial for species with low population numbers for which even low rates of additive mortality may affect population stability. In the southern Sierra Nevada fisher population, for example, 2 of 14 losses were suspected of being the result of poaching, and an additional two losses resulted from vehicle collisions (USDI Fish and Wildlife Service 2004). The likelihood for negative human interactions with wildlife (including encounters leading to issuance of depredation permits for bears or mountain lions) also increases as greater human access is provided by roads and motorized trails (Wisdom et al. 2000). Citations have been issued for poaching of bear, squirrels, songbirds, and other wildlife on the ENF, but the current magnitude of these impacts or their influence upon populations is largely unknown.

Changes in Behavior (displacement or avoidance, impacts on breeding behavior, and physiological impacts): Gaines et al. (2003) reviewed literature on road- and trail-associated effects upon wildlife and found that alteration of use of habitats in response to roads or road networks was the most common interaction reported. Fifty to sixty percent of the 29 focal species reviewed were impacted in this manner (Gaines et al. 2003). Studies have documented shifts in an animal’s home range area, shifts in foraging patterns, and disturbance of nesting or breeding behaviors resulting from motorized road or trail use and associated increased human recreation activity facilitated by motorized access (Foppen and Reijnen 1994; Johnson et al. 2000; Rost and Bailey 1979). Recreation activities (hiking, camping, fishing, shooting, etc.) that are associated with the access provided by motorized routes, result in indirect disturbance and displacement effects that often exceed the direct influence of the roads and trails.

Many species avoid areas in proximity to roads or trails, or exhibit flight behavior within a certain distance of route use, though studies documenting the magnitude and duration of behavioral responses are limited. Road usage by vehicles has a significant role in determining animal's road avoidance behavior. Black bear, for example, crossed roads with low traffic volume more frequently than roads with high traffic volume, and almost never crossed interstate highways (Brody and Pelton 1989). Perry and Overly (1977) documented displacement of deer up to 800 meters from major roads, and from 200 to 400 meters from secondary and primitive roads. Van Dyke et al. (1986) documented that mountain lions avoided improved native surface roads and surfaced roads, and selected home range areas with lower road densities than the study area average.

Activities that create elevated sound levels or result in close visual proximity of human activities at sensitive locations (e.g., nest trees), have the potential to disrupt normal behavior patterns. Studies of the effects of human disturbance upon wildlife have revealed that the immediate postnatal period in mammals and the breeding period in birds are time periods when individuals are most vulnerable to disturbance. Intrusion-induced behaviors such as nest abandonment and decreased nest attentiveness have led to reduced reproduction and survival in species that are intolerant of intrusion (Knight and Gutzwiller 1995). Foppen and Reijnen (1994), for example, found that the reproductive success of forest bird species declined in areas fragmented by roads. Anthony and Isaacs (1989) found that the mean productivity of bald eagle nests was negatively correlated with their proximity to main logging roads, and the most recently used nests were located in areas farther from all types of roads and recreational facilities when compared to older nests in the same territory. Wasser et al. (1997) found that stress hormone levels were significantly higher in male northern spotted owls (but not females) when they were located less than 0.25 miles from a major logging road compared to spotted owls in areas greater than 0.25 miles from a major logging road. Chronic high levels of stress hormones may have negative consequences on reproduction or physical condition of birds, though these effects are not well understood.

Habitat Modification (habitat loss, fragmentation, edge effects, snag and down log reduction, routes for competitors, movement barriers)**:** Road and trail networks remove habitat but also have a broader effect than just the conversion of a small area of land to route surfaces. Andren (1994) suggested that as landscapes become fragmented, the combination of increasing isolation and decreasing patch size of suitable habitat is negatively synergistic, compounding the effects of simple habitat loss. In particular, species associated with old forest habitats may be impacted by such effects. One study determined that the total landscape area affected by roads was 2.5 to 3.5 times the actual area occupied by the road feature, assuming a 50 meter influence along the road's edge (Reed et al. 1996). A decrease in interior forest patch size results in habitat loss and greater distance between suitable interior forest patches for sensitive species like the California spotted owl and American marten. As roads and trails break up forest patches, this may increase nest predation and parasitism rates by species such as jays or cowbirds (Miller et al. 1998), or provide increased access for generalist competitors or predators, such as coyotes (Buskirk and Ruggiero 1994).

Additional habitat modification occurs as an indirect effect of managing roads or trails for public wheeled motor vehicle use. Trees posing a potential safety hazard ("hazard trees") are removed along roads. These trees are typically snags that are within a tree-height distance from the road. This safety policy results in a "snag free" zone of 200 to 300 feet from a road's edge, also affecting the recruitment of large down wood within this zone. Few hazard trees are typically removed along trails.

Major highways are known to create movement barriers for a number of wildlife species, particularly wide-ranging carnivores and ungulates, and are suspected of being a major factor in the decline of some forest carnivores, such as fisher and marten (Brody and Pelton 1989, USDA FS 2001a). The slower speed and lower traffic volume roads and trails that are being evaluated in the project Alternatives are less likely to create barriers to movement. However, the extent to which denser networks of roads and trails might result in barriers to movement for some wildlife species is unknown (USDA FS 2001a).

Data & Assumptions

For a general discussion of the data collected and assumptions used in this analysis, see the beginning of Chapter 3. Habitat and occurrence data that was available for the species addressed in this analysis has been described in the Affected Environment section. The following assumptions are specific to the analysis for terrestrial wildlife.

Direct and indirect effects are analyzed on National Forest lands within the project boundary (exclusive of the Rock Creek Recreational Trails area). The direct and indirect effects of the project Alternatives reflect the existing condition, which includes routes covered by the Federal Highway Safety Act, County Roads, and State and Federal Highways already designated for public use. Analysis tables show the effects a

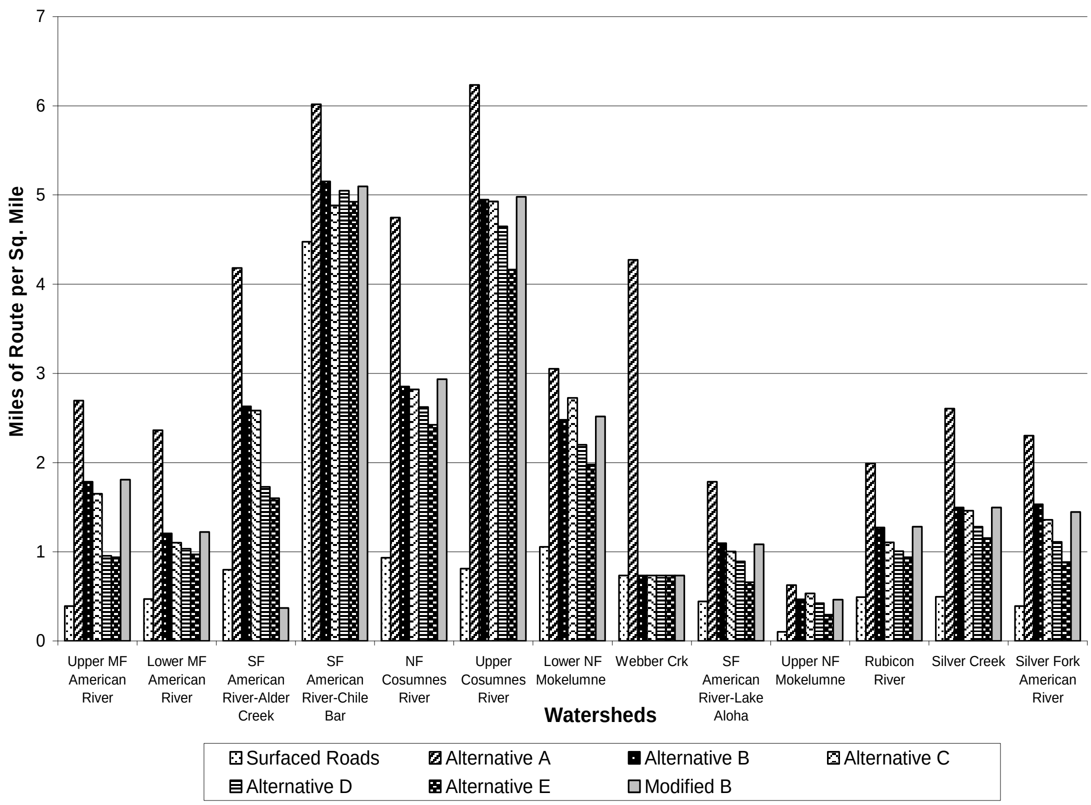
Indicator Measure 6: Effects of the individual unauthorized routes that are being considered for designation in the action alternatives.

The rationale for each of these indicators is as follows:

Indicator Measure 1: Route density is a useful index of both direct and indirect effects of motorized routes on wildlife populations and biodiversity (Findlay and Boudages 2000, USDA FS 1998). Most road and motorized trail-associated factors influencing wildlife are, to some degree, related to the density of motorized routes (as described in following sections).

The density of roads and motorized trails can be described at various scales and in a number of ways. The simplest description is as an overall mileage or average density across NFS lands. The route density metric can be made more informative by evaluating densities at a smaller scale such as within 15,000-acre to 170,000-acre 5^{th}

Figure 3-I.1: Density of routes within 5th field watersheds.



Indicator Measure 2: Human encroachment into wildlife habitats is one of the primary ways that people influence wildlife populations (Knight and Gutzwiller 1995), and the effects of human intrusion become more pronounced where people gather and camp. Motorized routes allow human access to wildlife habitat thereby increasing the direct impacts of human activities. The number of known dispersed recreation sites (both campsites and day use areas) that are accessed by motorized routes, is one measure of the extent and magnitude of human activity that may accompany designation of motorized routes (Table 3-I.4). Recreation activities can result in a broad spectrum of effects to terrestrial wildlife, including altered behavior, increased stress, or changes in productivity (as described in the previous section). As a result, populations can change in size and distribution (Knight and Cole 1991). The number of dispersed recreation sites accessed by motorized routes provides a useful index of these direct and indirect effects associated with this project.

Table 3-I.4: Number of dispersed recreation sites within 300 feet of unsurfaced motorized routes open by Alternative

	Alt A	Alt B	Mod. B	Alt C	Alt D	Alt E
Number of dispersed sites accessed	503	400	324	367	344	255

Indicator Measure 3: Motorized routes, in general, produce an "area of effect" within which wildlife densities may be diminished or habitat use may be altered (Trombulak and Frissell 2000, Findlay and Bourdages 2000). Species behaviors and habitats are modified at varying distances from motorized routes. These distances can be established for individual species, habitats, and types of influences, based upon the best available literature, and the cumulative magnitude of many road and trail-associated factors can then be evaluated by considering the proportion of a species habitat that occurs within this roadside zone of influence. Gaines et al. (2003) used this approach to develop simple geographic information system (GIS)-based models to evaluate the cumulative effects of recreation routes on habitats for focal wildlife species on two National Forests. The process "yielded a basis for the consistent evaluation of the cumulative effects of roads and recreational trails on wildlife habitat (Gaines et al. 2003)". The scientific literature described by Gaines et al. (2003) and additional studies cited in this assessment, are used to establish habitat models for this assessment. Limited studies and the complexity of influences limits the conclusions that can be reached, however. In particular, little information exists on how to determine the relationship between the proportion of a species' habitat influenced by motorized routes and population trends (Gaines et al 2003). For most species, additional research is needed to suggest meaningful thresholds. Nonetheless, this indicator measure provides a consistent index of the relative degree to which the project alternatives influence species' habitats, allowing this information to be considered in relation to the status of particular habitats or populations on the forest.

Indicator Measure 4: Activities that create elevated sound levels or result in close visual proximity of human activities at sensitive locations have the potential to significantly disrupt normal behavior patterns. A number of species are intolerant of disturbance at nesting or breeding locations, and the reproductive success of these species could be altered by road or motorized trail-use within a specified distance of their reproductive sites (Anthony and Isaacs 1989, USDI Fish and Wildlife Service 2006). Reproductive sites are mapped for a relatively small number of species on the ENF (bald eagles, spotted owls, goshawk, deer), but for these species, the potential effect of motorized routes at these sites can be analyzed using this metric. Disturbance at other sensitive sites, such as key foraging areas may also result from motorized use.

Indicator Measure 5: The effects of seasonal closures may have substantial influence on species that occupy portions of their range only seasonally (such as migratory mule deer). Differences in management of over-the-snow travel are noted as potentially influencing effects upon several species.

Indicator Measure 6: Since unauthorized routes were typically developed without the benefit of established road or trail design standards, and since these routes were not analyzed for their effects to terrestrial wildlife, this measure displays individual route effects. Individual unauthorized routes that would affect known sensitive locations (such as nest sites) or habitats of limited occurrence, such as meadows and patches of old forest habitat, are displayed in this measure.

Environmental Consequences

Old Forest Species and Habitats Group

Literature reviewed on 71 amphibian, bird, and mammal species associated with late-successional forests showed these species to be affected by a wide variety of road and trail-associated factors including collisions, trapping, collection, displacement or avoidance, disturbance at a specific site, edge effects, habitat loss and fragmentation, movement barrier or filter, and routes for competitors or predators (Gaines et al. 2003). These factors will be discussed as they apply to the various species analyzed within this group.

The density of open motorized routes has been evaluated at two scales relevant to old forest species: (1) an average density of open motorized routes within 5th field watersheds (Figure 3-I.1); and (2) a moving window analysis of open route density within the Old Forest Emphasis

Area land allocation (Table 3-26). The LRMP designates “Old Forest Emphasis Areas” as a land allocation to be managed for the purpose of “maintaining or developing old forest habitat in areas containing the best remnant blocks or landscape concentrations of old forests and in areas that provide old forest functions, such as connectivity of habitat.”

In all watersheds, Alternative A results in the highest density of open motorized routes on NFS lands. Motorized routes would exceed 2 miles per square mile across 55 percent of the Old Forest Emphasis Area land allocation. Nine percent of the Old Forest land allocation would have an open route density exceeding 6 miles per square mile. The highest density of open routes would occur in the Upper Cosumnes River watershed where motorized routes would exceed an average density of 6 miles per square mile on NFS lands (Figure 3-I.1). Alternative A would maintain nine percent of the project area without motorized routes, and 20 percent of the Old Forest Land Allocation without motorized routes. The action alternatives result in progressively lower route densities. Alternative E results in the greatest percentage of Old Forest Emphasis Area lands with zero route density, 31 percent, compared to 24 to 26 percent in Alternatives B, C, and D and M.

Roads and trails dissect larger patches of old forest habitat into smaller fragments, creating edge habitat along both sides of the road and reducing the amount of interior old forest habitat (Reed et al. 1996). Species associated with old forest habitats are often vulnerable to the effects of forest fragmentation and increased edge, where changes in predator occurrence or predator success may affect populations. None of the action alternatives propose to construct routes, but the roads and trails that are maintained as open for wheeled motor vehicle use in the alternatives result in differing degrees of old forest fragmentation. There are various ways to analyze landscape structure and fragmentation in relation to roads (Reed et al. 1996); for this project, the average size of undissected old forest patches was evaluated, providing a relatively simple metric of old forest fragmentation. Old forest habitat patches were defined as CWHR size and density class 5D or 5M and their adjacent 4D stands. The average size of these patches in each alternative was analyzed both across the forest and within the “Old Forest Emphasis Area” land allocation.

Based upon the open routes in each alternative, patches of old forest habitat are most affected by open routes in Alternative A and least affected by open routes in Alternative E, both across the forest and within the Old Forest Emphasis Area land allocation (Table 3-I.6). This is indicated by the fact that the average size of an undissected old forest patch increases incrementally between Alternatives A, B, Modified B, C, D and E. It increases by about 33 percent between Alternative A and Alternatives B or Modified B, and by another 14 percent between Alternatives B or Modified B and Alternative E.

Large habitat areas are particularly important for interior forest species because of the reduced influence of negative edge effects and the availability of resources (Ambuel and Temple 1983, Keller and Anderson 1992). Alternative E creates the least amount of edge habitat within old forest patches. Impacts associated with old forest habitat fragmentation are likely to increase incrementally from Alternative E to D, C, Modified B, B and A.

Table 3-I.5: Proportion of Old Forest Emphasis Area acreage with route densities

Route Density (mi/mi2)	Percentage of Old Forest Allocation (National Forest Lands Only)					
	Alt A	Alt B	Mod. B	Alt C	Alt D	Alt E
0	19.7	23.5	23.9	25.9	25.1	31.4
0 - 2	25.8	33.1	32.7	33.8	37.3	36.6
2 - 4	25.2	28.8	28.9	27.1	27.5	23.7
4 - 6	20.5	12.6	12.0	11.4	8.6	7.1
> 6	8.9	2.1	2.5	1.8	1.5	1.2

(analyzed within a 0.9 km radius moving window)

Table 3-I.6: Average size of undissected old forest patches (acres)

Land Allocation	Surfaced roads only	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Old Forest Emphasis Areas	45.6	19.8	25.6	25.7	26.9	28.3	30.0
Entire Forest	44.8	20.2	26.1	26.0	26.9	28.5	30.0

The individual unauthorized routes that affect patches of old forest habitat are shown in Table 3-I.27, at the end of the Terrestrial Wildlife Section. Alternative B designates 33 unauthorized routes that bisect patches of old forest habitat; 13 of these routes also occur within the Old Forest Emphasis Area land allocation. Alternative D designates 26 routes and C designates 15 routes bisecting old forest patches, with 7 and 4 of these routes occurring within the Old Forest land allocation, respectively. Unauthorized routes designated in Alternatives E and Modified B would have the least effect upon old forest habitat. These Alternatives designate 13 unauthorized routes that bisect old forest patches, three of which are designated as trails. Only one of these routes occurs within the Old Forest Land Allocation and this route would be designated as a motorcycle and ATV trail, with less effect upon opening forest canopy.

California Spotted Owl

Studies reviewed by Gaines et al. (2003) indicated that northern spotted owls were likely to be affected by the following road and motorized trail-associated factors: collisions, disturbance at a specific site, physiological response, edge effects, and snag reduction. These same factors, as well as “habitat loss and fragmentation” are expected to affect California spotted owls based upon review of the available literature (Verner et al. 1992, Seamans 2005, Blakesley 2003).

Collisions: Collision with motor vehicles is known to be a source of mortality for spotted owls on the Forest, but the incident rate remains unknown. Collisions are most likely to occur on higher speed surfaced roads; the low speed native surface routes being evaluated in this project probably present little risk. Additional human-associated losses, such as illegal shooting may occur, but the incident rate is unknown.

Disturbance at a Specific Site and Physiological Response: The issue of elevated sound and visual disturbance of forest wildlife species remains a complex and poorly understood subject. The Forest Service, Region 5, has generally assumed that activities (including road and trail use) occurring farther than 0.25 miles from a spotted owl nest site have little potential to affect spotted owl nesting (USDA Forest Service, 2004). This distance corresponds to the mean distance at which Mexican spotted owls were found to show an alert response to noise disturbance from chainsaws (Delaney et al. 1999). In addition, Wasser et al. (1997) found that stress hormone levels were significantly higher in male northern spotted owls (but not females) when they were located less than 0.25 miles from a major logging road compared to spotted owls in areas greater than 0.25 miles from a major logging road. Preliminary results from studies of motorcycle use in proximity to northern spotted owl nest sites show similar findings. These effects are likely more significant for male than for female spotted owsl, and appear to be more significant in May when the chicks are still in the nest than in July when they have fledged and have some ability to escape the disturbance (Hayward and Wasser 2008). Chronic high levels of stress hormones may have negative consequences on reproduction or physical condition of birds though these effects are not well understood (Marra and Holberton 1998, Gaines et al. 2003, USDI Fish and Wildlife Service 2006b).

The U.S. Fish and Wildlife Service prepared an exhaustive review of the available literature in 2006 to develop guidance on evaluating the effects of auditory and visual disturbance to northern spotted owls (USFWS 2006b). Although not developed specifically for the California spotted owl, there is no reason to assume that the information presented would not apply to the California subspecies. A flush response near active nests during the reproductive period was considered to a reliable indicator of harassment by the U.S. Fish and Wildlife Service since it indicated a significant disruption of normal behavior patterns which might increase the rate of predation upon adult or juvenile spotted owls. The Fish and Wildlife Service felt that other behaviors or responses, such as an alert response or elevated levels of corticosteroid, did not provide a reliable indication of harassment. Studies reviewed by the Fish and Wildlife Service observed the distance at which spotted owls typically flush from branches to generally be less than 60 meters from the noise source. Delaney et al. (1999) reported that 30 percent of Mexican spotted owls flushed from branches during the fledging period (though not during the incubation or nestling period) when a person and operating chainsaw were within 60 meters of the owls. Swarthout and Steidl (2001) found that a 55-m buffer “would eliminate virtually all behavioral responses of Mexican spotted owls to hikers.”

Based upon its review of the literature, the U.S. Fish and Wildlife Service concluded that behavior indicating “harassment” may occur when the action-generated sound level exceeds ambient conditions by 20 to 25 dB as experienced by a spotted owl, or when the visual proximity of human activities occurs less than 40-m from an active nest site. The Service created categories for action-generated sound ranging from “natural ambient” to “extreme” within which they placed similar sound sources. They acknowledged considerable variability within and among these categories but attempted to address the variability by “establishing a conservative approach to estimating distances at which harassment behaviors may manifest.” Sound levels associated with motorized use of roads and trails typically fell within the “moderate” range, although some actions, such as use of heavy equipment for road grading, would fall into the “high” sound level category. By calculating attenuation rates of sound across habitat conditions representative of the forest habitat occupied by spotted owls, the Fish and Wildlife Service estimated likely harassment distances due to action-generated sound levels. These distances were 50 meters for most road and trail use and 150 meters for road grading activity, where natural ambient sound levels are not substantially influenced by human activities or natural sources. Distances were less where ambient sound levels were higher.

The implication of behavioral disruptions also remains uncertain. Damiani et al. (2007) compared reproductive success between disturbed and non-disturbed territories over a 19 year timeframe. Their results indicated that noise from management activities (primarily timber harvest) occurring during the breeding season did not have immediate effects on the reproductive output of northern spotted owls but that "disturbance may result in cumulative negative effects on reproductive output over the long-term (observable after a decade)."

Habitat Loss, Fragmentation and Edge Effects: Studies have shown California spotted owls to be sensitive to changes in canopy closure and habitat fragmentation (Seamans 2005, Blakesley 2003, North et al. 2000), such as could result from road networks. Roads and motorized trails can result in a decrease in interior forest patch size, decreasing the amount of habitat and increasing the distance between suitable interior forest patches for old forest species like the California spotted owl. As migration between suitable habitat patches becomes more difficult, suitable habitats are less likely to remain occupied over time (Reed et al. 1996, Zabel et al. 1992). Trails, with their narrower width, result in little or no reduction in forest canopy and would therefore be unlikely to result in negative edge effects or habitat fragmentation as compared to roads.

Snag Reduction*:* Reduction of snags (and eventually of fallen snags or logs) is expected to occur along roads open to use as a result of removing hazard trees (trees which pose a risk of falling upon a road or facility). In order to manage roadside hazards, few snags would be expected to be retained within an area of about 60 meters (200 feet) alongside roads open for public use. Logs are also removed by the public along roadside corridors for fuelwood. Since snags and down logs are important habitat components for many of the species associated with old forest habitats, including spotted owls, old forest habitat quality within these roadside corridors is generally less than similar interior old forest habitat.

Direct and Indirect Effects for All Alternatives – California Spotted Owl

Indicator Measure 1: The magnitude of motorized route-associated effects described above will generally relate to the density of motorized routes and the associated extent of public access and use. When compared to Alternative A, Alternatives B and Modified B, C, D, and E result in progressively lower densities of open motorized routes on NFS lands. Alternatives A, B/Modified B, and C, would result in more than 50 percent of NFS lands outside Wilderness Areas having route densities exceeding 2 miles per square mile, whereas Alternatives D and E result in more than 50 percent of NF lands below this density. Alternatives B/Modified B, C, D, and E will result in progressively lower risk of direct or indirect effects associated with disturbance, avoidance of preferred habitats, or habitat changes.

The reduced influence of edge effects and the increased availability of resources in larger habitat patches is likely important for old forest associated species including the California spotted owl. As shown in Table 3-I.6 and described in the Section on Old Forest Habitat and Species, Alternative E maintains the largest undisected old forest patches. Impacts associated with old forest habitat fragmentation increase incrementally from Alternative E to D, C, Modified B, B and A

Indicator Measure 2: The number of dispersed recreation sites accessed by motorized routes in Alternative A is more than twice the number accessed by Alternative E (Table 3-I.4). The magnitude of human activity that may accompany designation of motorized routes would therefore be expected to be highest in Alternative A. Alternatives B, C, Modified B, D, and E access progressively fewer dispersed recreation sites, thereby incrementally reducing the likelihood of human disturbance to spotted owls or their habitat.

Indicator Measure 3: Spotted owls are likely to be affected by edge effects, snag and downed log reduction, and habitat loss and fragmentation within a distance of at least 60 meters alongside roads and motorized trails (hazard tree removal typically occurs within 60 meters of the road; edge and fragmentation effects are also likely to occur within this zone (Gaines et al. 2003)). Spotted owl habitat occurs across the Forest, but PACs and HRCA land allocations are managed with an objective of providing quality nesting and foraging habitat surrounding known spotted owl sites. To evaluate these effects, the proportion of PAC and HRCA habitat, and the proportion of suitable spotted owl habitat across the Forest occurring within 60 meters of open routes under each alternative, is shown in Table 3-I.7. Thresholds associated with this measure have not been established, but relative changes in the habitat area influenced by these road and trail-associated factors can be evaluated and compared.

Table 3-I.7: Percent of spotted owl land allocations (PACs and HRCAs) and percent of spotted owl habitat that occurs wi

limited to avoid disturbance to nesting spotted owls (USDA Forest Service 2004), disturbance effects are probably a low risk beyond the 60 meter distance.

Sixteen percent of spotted owl activity centers occur within 60 meters of motorized routes in Alternative A, where there is likelihood that auditory or visual disturbance may cause spotted owls to flush from a perch. Actual disturbance effects will vary in relation to site-specific factors such as traffic levels, cover, and topography at the site. Nonetheless, Alternative A presents a risk of road or motorized trail-associated disturbances affecting a substantial proportion of the spotted owl breeding sites on the Forest.

Alternatives B, Modified B, C, D, and E also result in a number of spotted owl activity centers occurring within 60 meters of a motorized route, but the number of sites declines to between 8 (Alternative E) and 14 (Alternative B and C) (Table 3-I.8). When existing surfaced routes are considered, this results in about 10 percent of spotted owl activity centers on the forest occurring within 60 meters of routes in Alternatives B, Modified B and C, and seven percent and five percent in Alternatives D and E, respectively. Alternatives E and Modified B addressed proposals for new roads or trails (ML1 and unauthorized routes) by generally not opening these routes when they occurred within spotted owl PACs or near activity centers. Exceptions were made for three routes of particular importance as connector routes and for several additional routes which occurred within the edge of a PAC. Using this approach, Modified B and E do not designate new routes within 60 meters of spotted owl activity centers. This intent was not applied to Alternatives A, B, C, and D, and these alternatives designate more new routes that have potential to disturb spotted owl nests as shown in Table 3-I.9.

Table 3-I.8: Number of spotted owl activity centers *(n= 201)* that occur within 0.4 kilometers (0.25 miles) and within 60 meters of motorized routes in this project

Distance	Number of spotted owl activity centers[1]					
	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Within 0.4 kilometers	107	82	80	76	71	63
Within 60 meters	27	14	13	14	9	8

[1]An additional 59 activity centers are within 400 m and an additional 6 are within 60 m of surfaced routes.

Table 3-I.9: Number of spotted owl sites potentially affected by new motorized routes proposed under each alternative

Distance from New Motorized Routes	Number of spotted owl activity centers or PACs					
	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Within 0.4 kilometers	58	27	5	18	13	5
Within 60 meters	13	2	0	2	1	0
Within PACs	162	68	34	56	45	26

Indicator Measures 5: Does not apply to this species.

Indicator Measure 6: Individual unauthorized routes occurring within spotted owl PACs and proposed for designation in the action alternatives, are shown in Table 3-I.28, at the end of the Terrestrial Wildlife Section. Alternative B designates the greatest number of unauthorized routes (13) within spotted owl PACs. Alternatives D, C, E and Modified B designate incrementally fewer routes in PACs; Modified B designates only two unauthorized routes within spotted owl PACs, one of which is Baltic Ridge Road which has been managed as part of the Forest Service system for many years. None of the alternatives except Alternative A designate unauthorized routes within 60 meters of spotted owl activity centers.

Cumulative Effects – California Spotted Owl

The cumulative density of open routes increases within the larger cumulative effects analysis area that includes private lands within the Forest boundary as well as the routes already designated within the Rock Creek Recreational Trails Area. Within this larger cumulative effects analysis area, an additional two to three percent of the spotted owl habitat is influenced by open motorized routes under each of the Alternatives (Table 3-I.7).

Appendix E provides a list and description of past, present, and reasonably foreseeable projects on the ENF and private lands within the ENF boundary. Some, but not all, of these activities will contribute to effects upon California spotted owls. In its Notice of Finding on a petition to list the California spotted owl, the USFWS identified that loss of habitat to stand replacing fires and habitat modification for fuels reduction were the primary risk factors to California spotted owls occurring on NFS lands (USFWS 2006).

On the ENF, three wildfires have eliminated about 6,400 acres of spotted owl habitat and affected 13 spotted owl protected activity centers since 2001, based upon analysis in NEPA documents for post-fire restoration. Forest thinning treatments (designed to reduce the risk of additional habitat loss to wildfires) have treated about 57,000 acres of NFS land over the past 10 years (see Appendix E) and have affected approximately 10,000 acres, or five percent of spotted owl land allocations (PACs and HRCAs) between 2001 and 2006. These wildfires and fuels treatment projects have resulted in reduction in the amount and quality of spotted owl habitat on the ENF since 2001. Monitoring of vegetation indicates a decline in the amount of spotted owl habitat between 1991 and 1997 (see project MIS report).

Fuels reduction projects will continue to be the primary activity affecting spotted owl habitat on the ENF (see Appendix E). Forest thinning projects will occur on an estimated 5,000 acres per year, based upon the acreage treated in 2006. Although these treatments will degrade habitat, it is anticipated that over time, the amount of habitat removed in stand replacing wildfires will be reduced as a result of these treatments (USDA FS 2004b). CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted. Timber harvest on private lands is generally more intensive and does not typically maintain habitat suitability for spotted owls.

The effect of open motorized routes on spotted owl populations or habitats was not identified as a significant risk factor by either the Forest Service (USDA FS, 2004b) or the USFWS (2006). However, given the proportion of spotted owl nest sites and habitat potentially affected, and considering the projections for future increases in recreation uses and OHV activity, Alternative A may, over time, contribute to cumulative effects upon spotted owl populations. Because Alternative A does not restrict vehicles to designated routes, there is a high degree of uncertainty about future route proliferation in owl habitat which may have disturbance and habitat effects beyond the effects of routes open to motorized use.

The ENF Management Indicator Species (MIS) Report describes an estimated decline in the amount of spotted owl habitat on the ENF between 1991 and 2007, but a spotted owl population that is estimated to be stationary. As described in the project MIS report, project alternatives affect habitat quality but will not influence measured trends in the amount of Forest-wide spotted owl habitat. The Biological Evaluation prepared for this project determines that the effects of the project alternatives combined with the effects of additional activities occurring within the analysis area, are not expected to result in a loss of viability or lead to a trend toward Federal listing for the California spotted owl. This is based on the fact that the spotted owl population on the ENF is currently estimated to be stationary (USFWS 2006), and based upon the findings of the USFWS which did not include disturbance resulting from road and trail use as a factor of concern when evaluating threats to the species (USFWS 2006).

Northern Goshawk

Northern goshawks were found likely to be affected by the following road and motorized trail-associated factors: habitat loss or fragmentation, disturbance at a specific site, edge effects, and collection (Gaines et al 2003).

Collection: Evidence of shooting and harassing of northern goshawks in areas receiving extensive human recreation use, was cited in the EIS for the Sierra Nevada Forest Plan Amendment (USDA FS, 2001a). Similarly, illegal harvest of goshawks for falconry has been identified as a risk to local populations in some areas (USDA FS 2001a). These impacts have not been documented on the ENF, and while higher open motorized route densities may increase risk, the risk is expected to remain low under all alternatives.

Disturbance at a Specific Site (Nest Sites): Some types of human disturbances to goshawk nests have been a suspected cause of nest abandonment. Critical times for human disturbance are through the nesting and post fledging period (February 15 through September 15). Because snow is not removed from most roads and trail and because northern goshawks initiate breeding when the ground is still covered with snow, nests are sometimes directly located along roads and trails that provide flight access. Following snow melt, these sites can be prime candidates for conflict as humans begin using the roads and trails (USDA FS 2001a). Northern goshawks are aggressive nest defenders that will attack humans that venture into active nest stands. The potential for negative human interactions increases where motorized routes or dispersed campsites are in proximity to goshawk nest stands (USDA FS 2001a).

The Forest Service, Region 5, has generally assumed that activities (including road and trail use) occurring further than 0.25 miles from a goshawk nest site have little potential to affect goshawk nesting (USDA FS 2004b). Grubb et al. (1998) reported that vehicle traffic from roads caused no discernable behavioral response by goshawks at distances greater than 400 meters (0.25 miles) from nests. Little information is available on disturbance distances for goshawks, but, as with other raptors, the risk of flushing from the nest or even nest abandonment is likely to increase as the disturbance distance decreases.

Habitat Loss and Fragmentation and Edge Effects: Goshawk have been shown to be sensitive to changes in canopy closure and habitat fragmentation (Beier and Drennan 1997, Daw and DeStefano 2001), such as could result from a road network.

Direct and Indirect Effects for All Alternatives – Northern Goshawk

Indicator Measure 1: See discussion for the California spotted owl, Figure 3-I.1, and Tables 3-I.3 and 3-26. The higher open route densities and access provided by Alternative A, results in greater opportunities for illegal collection of goshawks, but probably more importantly, it increases the likelihood for human disturbance to nesting birds or their habitat. These effects decrease incrementally in Alternatives B and Modified B, C, D, and E.

Indicator Measure 2: The number of dispersed recreation sites accessed by motorized routes in Alternative A is more than twice the number accessed by Alternative E (Table 3-I.4). The likelihood for human intrusion into goshawk nest stands would therefore be expected to be highest in Alternative A. Alternatives B, C, Modified B, D, and E access progressively fewer dispersed recreation sites. Alternative B accesses about 60 percent of the dispersed sites accessed under Alternative A, and Alternative E accesses about 40 percent of the sites accessed under

Alternative A (Table 3-I.4), thereby incrementally reducing the likelihood of human disturbance to goshawks or their habitat.

Indicator Measure 3: The distance that goshawks avoid or are displaced from habitat adjacent to open motorized routes has not been studied, but direct effects upon habitat (edge effects, snag and downed log reduction, habitat fragmentation) are likely to occur within a distance of at least 60 meters from roads and motorized trails. Hazard tree removal and woodcutting typically occurs within 60 meters of open roads. To evaluate the extent to which project Alternatives may influence goshawk habitat, the proportion of goshawk habitat occurring within 60 meters of open motorized routes was determined (Table 3-I.10). Thresholds associated with this measure have not been established, but relative changes in the habitat area influenced by these road and trail-associated factors can be evaluated and compared.

Effects upon goshawk habitat are virtually the same as those described for spotted owl habitats. Alternative A results in habitat effects (edge effects, snag and downed log reduction, and habitat fragmentation) within 21 percent of suitable goshawk habitat (Table 3-I.10). In Alternative A, all existing unauthorized routes remain open. Unauthorized routes would affect habitat within 41 of 92 goshawk PACs in this Alternative. The direct and indirect effects of open motorized routes (habitat fragmentation, edge effects, snag and log reduction) are likely to degrade habitat quality within these route corridors, and this may reduce nesting habitat effectiveness for goshawks, particularly where these effects are occurring within PACs.

Alternatives B/M, C, D, and E influence progressively less goshawk habitat, ranging from 15 percent (Alternative B and M) to 11 percent (Alternative E) (Table 3-I.10). Unauthorized routes contribute much less of this influence in the action alternatives affecting habitat within two PACs (Alternatives C and E) or three PACs (Alternatives B, Modified B and D).

Table 3-I.10: Percent of goshawk habitat that occurs within 60 meters of motorized routes

Analysis Area	Acres of Habitat	Percent of Habitat Affected (includes surfaced roads)						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS	281,531	5	21	15	15	14	13	11
Habitat on All Lands*	373,903	5	23	18	18	18	17	15

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measure 4: To evaluate the extent to which Alternatives may affect northern goshawk reproductive sites, the number of goshawk activity centers occurring within 400 m (0.25 miles) of motorized routes, and the number occurring within 60 m of motorized routes, was determined (Table 3-I.11). Goshawk activity centers represen

The action alternatives result in motorized routes being open within 60 meters of 11 to 6 sites (Table 3-I.11). When existing surfaced routes are considered, this results in open motorized routes potentially affecting 20 to 14 percent of goshawk nest sites in the action alternatives. Alternative E opens the fewest routes within this distance and the number of affected sites increases incrementally between Alternatives D and Modified B, C and B. Alternatives E and Modified B addressed proposals for new roads or trails (ML1 and unauthorized routes) by generally not opening these routes when they occurred within goshawk PACs or within 0.25 miles of a nest site. Exceptions were made for routes occurring along the edge of a PAC and for several routes of particular importance as connector routes. Using this approach, Alternative E and Modified B designate new routes in fewer goshawk PACs, and do not designate any new routes within 60 meters of goshawk activity centers (Table 3-I.12).

Table 3-I.11: Number of goshawk activity centers *(n= 92)* that occur within 0.4 kilometers (0.25 miles) and within 60 meters of motorized routes

Distance	Number of Goshawk Activity Centers					
	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Within 0.4 kilometers	48	33	32	30	31	31
Within 60 meters	17	11	8	10	8	6

[1]An additional 28 activity centers are within 400 m and an additional 7 are within 60 m of surfaced routes.

Table 3-I.12: Number of northern goshawk sites potentially affected by proposed new motorized routes

Distance from New Motorized Routes	Number of goshawk activity centers or PACs					
	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Within 0.4 kilometers	39	16	5	13	11	2
Within 60 meters	8	2	0	2	1	0
Within PACs	54	25	13	20	17	7

Indicator Measure 5: Vehicle noise from over the snow travel could disturb reproductive behavior during the early portion of the goshawk nesting season. Under any of the alternatives this effect is probably minor since limited accessibility restricts use to relatively few locations on the forest.

Indicator Measure 6: Individual unauthorized routes occurring within goshawk PACs and proposed for designation in the action alternatives, are shown in Table 3-I.29, at the end of the Terrestrial Wildlife Section. Alternatives B and D designate 3 unauthorized routes which occur 7 -1.1475 TD.062(v)14.8(ref91.02 d.48 Tm.0039 .86 .47998 1odut.)Tjn2.83ives D

Appendix E provides a list and description of past, present, and reasonably foreseeable projects on the ENF and private lands within the forest boundary. Some, but not all, of these activities will contribute to effects upon northern goshawks. In 2001 and 2004 the Forest Service amended Sierra Nevada Forest Plans to better address the needs of old forest-associated species (USDA FS 2001a and 2004b,c). During this assessment, the following risk factors were identified for northern goshawks in the Sierra Nevada: (1) changes to the amount and quality of goshawk habitat from timber harvest and fuels treatments; (2) loss of breeding territories due to stand replacing fires; and (3) breeding site disturbance from vegetation treatments, human recreation, or falconry harvest. Fuels reduction treatments and wildfire effects are identified as the predominant effectors of goshawk habitat.

On the ENF, three large wildfires have burned about 20,600 acres and eliminated about 6,400 acres of goshawk habitat on NFS lands since 1997. Forest thinning treatments (designed to reduce the risk of additional habitat loss to wildfires) have treated about 57,000 acres of NFS land over the past 10 years (see Appendix E). These wildfires and vegetation treatments have been primary factors affecting the amount and quality of goshawk habitat on the ENF over the past decade. The ENF MIS report also notes a decline in the amount of goshawk habitat between 1991 and 1997 (see project MIS report).

Fuels reduction projects will continue to be the primary activity affecting goshawk habitat on the ENF in future years (see Appendix E). Forest thinning projects will continue to occur on an estimated 5,000 acres per year, based upon the acreage treated in 2006. Although these treatments will degrade nesting habitat, it is anticipated that over time, the amount of habitat removed in stand replacing wildfires will be reduced as a result of these treatments (USDA FS 2004). CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted. Timber harvest on private lands is generally more intensive and, except for known nest stands, does not typically maintain habitat suitability for goshawks.

Non-motorized recreation (hiking, cycling, and equestrian use) occurs along an additional 375 miles of non-motorized summer trails. Human disturbance from use of non-motorized routes contributes to the direct and indirect effects of the project alternatives. This, combined with the potential disturbance effects that Alternative A may have on 26 percent of goshawk nest sites (those occurring within 60 meters of a motorized route), suggests that Alternative A presents at least a moderate risk of affecting goshawks through disturbance at breeding sites. Because Alternative A does not restrict vehicles to designated routes there is a high degree of uncertainty about future route proliferation in goshawk habitat which may have disturbance and habitat effects beyond the effects of routes open to motorized use. Considering the projections for future increases in recreation uses and OHV activity (refer to the Recreation Section), these effects, combined with the direct and indirect effects of project alternatives, could, over time, result in measurable cumulative effects upon goshawk habitat and nesting success. This risk is considerably greater in Alternative A and declines incrementally under Alternatives B or Modified B, C, D, and E.

The Management Indicator Species (MIS) Report prepared for this project describes a declining trend in the amount of goshawk habitat on the ENF between 1991 and 2007. Although project alternatives affect habitat quality, they will not influence measured trends in the amount of goshawk habitat. Project alternatives contribute to impacts that are associated with northern goshawk risk factors, but, at present, there is no indication that the magnitude of these effects is such that they will cumulatively result in a loss of viability or lead to a trend toward Federal listing for the northern goshawk (see project Biological Evaluation).

American Marten

Motorized routes can impact marten in a number of ways. The Sierra Nevada Forest Plan Amendment (USDA FS 2001a) and Gaines et al. (2003) found marten likely to be affected by the following road and motorized trail-associated factors: trapping, collisions, displacement or avoidance, habitat loss or fragmentation, snag reduction, down log reduction, edge effects, movement barrier or filter, and route for competitors.

Human-caused mortality*:* Marten are known for their vulnerability to trapping in many parts of their range. In California, however, body-gripping traps have been banned since 1998 and, as a result, the likelihood of incidental capture of marten by legal fur trapping has been dramatically reduced. Illegal harvest threats remain and could increase in relation to greater accessibility. At present, illegal trapping or shooting of marten is not known to be a substantial source of mortality (USDA FS 2001a).

Collision**:** Buskirk and Ruggerio (1994) identified collisions with motor vehicles as a source of marten mortality. There is concern that major highways, such as Highways 50 and Highway 88 on the ENF, may become mortality sinks for traveling marten. Collisions are much less likely to occur along the slower-speed native surface routes that are being evaluated for designation in this project.

Displacement or Avoidance: Robitaille and Aubrey (2000), studying marten in an area of low road density and traffic (primarily logging roads), found that marten use of habitat within 300 and 400 meters of roads was significantly less than habitat use at 700 or 800 meters distance. Although marten were detected in proximity to roads in their study, significantly less activity occurred within these zones. In a study conducted on the Lake Tahoe Basin Management Unit and Sierra National Forest, however, Zielinski (2007) found that marten occupancy or probability of detection did not change in relation to the presence or absence of OHV use. The study did not, however, measure behavioral changes or changes in use patterns and the study authors caution that application of their results to other locations would apply only if OHV/OSV use at the other locations is no greater than reported in their study.

Habitat Loss and Fragmentation, Edge Effects, Movement Barriers: Martens are known to be sensitive to changes in overhead cover, such as can result from roads or trails (Hargis and McCullough 1984, Buskirk and Ruggiero 1994). Roads and trails can fragment habitat, and could thus affect the ability of marten to use otherwise suitable habitat on either side of the route.

At a landscape scale, patches of preferred habitat and the distribution of openings with respect to habitat patches may be critical to the distribution and abundance of martens (Buskirk and Ruggiero 1994). While marten use small openings, and particularly meadows for foraging, these openings must occupy a small percent of the landscape. Martens have not been found in landscapes with greater than 25 percent of the area in openings (Hargis and Bissonette 1997; Potvin et al. 2000). As landscapes become fragmented, the combination of increasing isolation and decreasing patch size of suitable habitat compounds the results of simple habitat loss (Andren 1994). Standards and guidelines in the ENF LRMP address concerns over habitat connectivity for old forest associated species by directing that projects “minimize old forest habitat fragmentation” and “assess the potential impacts of projects on the connectivity of habitat for old forest associated species,” particularly marten and fisher (USDA FS 2004).

Highways, such as 50 and 88, are suspected of creating movement barriers for marten. The extent to which movement patterns may also be affected by smaller forest roads, such as those that may be open to use, remains unknown but has been identified as a potentially significant risk to Sierra Nevada martens (USDA FS 2001a).

Routes for Competitors: Martens avoid habitats that lack overhead cover presumably because these areas do not provide protection from avian predators. Roads that are driven during the winter months may allow coyotes to enter into marten winter habitat, affecting marten through competition or direct mortality from predation. This has been identified as a significant threat within lynx habitat. Since both lynx and marten have unique morphologies that allow them to occupy deep snow habitats where they have a competitive advantage over carnivores, such as coyotes and bobcats, human modifications of this habitat, such as winter road use, over-the-snow travel, and snowmobile trails, can eliminate this advantage and increase access for predators and competitors. This has been identified as a potentially significant risk factor in the Sierra Nevada worthy of further investigation.

Snag and Down Log Reduction: High levels of coarse woody debris (snags, downed logs, root masses, large branches) is an essential component of marten habitat, especially during the winter months when marten require such structures for cover and hunting opportunities under the snow. In addition, large logs with cavities provide rest and den sites for marten. Activities that remove coarse woody debris are therefore likely to degrade marten habitat (Buskirk and Ruggiero 1994). As previously described in the spotted owl section, hazard tree removal along roads will reduce numbers of snags and, in turn, down logs within a distance of about 60 meters alongside roads. Motorized routes provide access to woodcutters, also reducing amounts of down wood within roadside corridors. These effects within 60 meters of roads may, however, be incidental to the displacement and avoidance factors that apparently influence marten use of habitat within a greater distance of motorized routes.

Disturbance at a Specific Location (meadows): Various studies in the Sierra have shown marten to have a strong preference for meadows and forest-meadow edges for foraging (USDA FS 2001a). Because of the importance of microtine rodents in the marten diet, the quality of meadow habitat (especially meadows surrounded by mature lodgepole and red fir forests) influences the quality of marten habitat (Spencer et al. 1983). Routes through meadows, and the associated damage that can occur from off-route use within meadows, can alter meadow hydrology and vegetation and have a negative effect on prey availability. The combination of route use and increased human activity, as well as the potential impacts of routes upon meadow vegetation, may result in loss of these more easily exploitable "prey patches."

Direct and Indirect Effects for All Alternatives – American Marten

Indicator Measure 1*:* The magnitude of effects caused by habitat loss and fragmentation, displacement or avoidance, and routes for competitors (as described above) will in general correspond with the density of motorized routes and the associated extent of public access and use. Standards and guidelines in the ENF LRMP direct that projects "minimize old forest habitat fragmentation" and emphasize old forest habitat connectivity. These effects, including old forest fragmentation, are described in the section on old forest habitat and in Tables 3-I.3, 3-I.5, and 3-I.6. As described in the Old Forest section, patches of old forest habitat are most affected by open routes in Alternative A and least affected by open routes in Alternative E, both across the forest and within the Old Forest Emphasis Area land allocation (Table 3-I.6). This is indicated by the fact that the average size of an undissected old forest patch increases incrementally between Alternatives A, B, Modified B, C, D and E. It increases by about 33 percent between Alternative A and Alternatives B or Modified B, and by another 14 percent between Alternatives B or Modified B and Alternative E. Alternative E results in the least fragmentation of old forest patches and is therefore likely to provide greater habitat connectivity for marten. Fragmentation effects increase incrementally from Alternative E to D, C, Modified B, B and A.

As route densities are reduced, habitat connectivity for marten is likely to be improved (Robitaille and Aubry 2000). The connectivity of higher elevation habitats that are unaffected by motorized routes is improved substantially in Alternative E as well as the other action alternatives, as compared to Alternative A (see Maps 9 through 13 at the end of Chapter 3). On the ENF, Inventoried Roadless Areas (IRAs, see IRA section) surround much of the Desolation and Mokelumne Wilderness Areas, and the Caples Creek Proposed Wilderness Area. These areas include red fir and lodgepole pine types that are preferred habitat for marten in the Sierra Nevada (USDA FS 2001a) and increase the size and connectivity of undisturbed habitat that occurs in the wilderness areas. By not designating routes within the IRAs, Alternative E provides greater connectivity of marten habitat as compared to the other alternatives which have some routes open within these areas.

Indicator Measure 2: Access to greater numbers of dispersed recreation sites in Alternative A increases the magnitude of human disturbance in marten habitat, and may result in decreasing size of habitat patches. Action alternatives B, C, D, Modified B and E, incrementally reduce this potential impact.

Indicator Measure 3: As previously described, Robitaille and Aubrey (2000) found that marten habitat use declined within a distance exceeding 300 to 400 meters from roads. To evaluate this influence under the project alternatives, the proportion of marten habitat occurring within 274 meters of open routes under each alternative is shown in Table 3-I.13. The relative changes in habitat effectiveness for marten can be evaluated and compared based on this analysis. Fragmentation, edge effects, and the reduction of snags and down wood, would also occur but probably within a smaller zone adjacent to motorized routes, as shown in Table 3-I.13.

Alternative A results in 68 percent of marten habitat occurring within a motorized route's zone of influence (about 20 percent being the result of surfaced roads). As described above, road and trail-associated factors within this zone are thought to affect marten in a variety of ways, including changes in behavior, and changes to habitat. Considering the variety of ways that road and trail-associated factors are suspected of affecting marten (habitat avoidance, habitat loss through fragmentation, increased competition and predation), motorized routes will have a high degree of influence on marten habitat usage in Alternative A (Table 3-I.13). In particular, old forest habitat remaining outside the "zone of influence" of motorized routes would be limited to isolated patches in this alternative. This could result in lower numbers of marten individuals supported by available habitat.

Alternatives B, Modified B, C, D, and E result in progressively lower proportions of marten habitat being influenced by motorized routes. All of the Alternatives continue to influence a substantial proportion of marten habitat, with the lowest effect (44 percent of habitat within the 274 meter zone of influence) in Alternative E (Table 3-I.13). Alternatives B, Modified B, C, and D result in more than 50 percent of marten key habitat occurring within 274 meters of a motorized route, where research indicates marten activity may be reduced. Edge effects and snag reduction are limited to a smaller portion of habitat but still affect 12 percent (Alternative E) to 20 percent (Alternative C) of habitat depending upon the alternative.

Although some assessments have predicted that marten may demonstrate population declines at relatively low levels of habitat fragmentation (USDA FS 2001a), a recent study of marten response to OHV use on the Lake Tahoe Basin and Sierra National Forest found that the presence of motorized routes had little effect on the probability of marten detection (Zielinski et al. 2007). This study found that marten occupancy or probability of detection did not change in relation to the presence or absence of motorized routes when the routes (plus a 50 meter buffer) did not exceed about 20 percent of a 50 square kilometer area, and traffic did not exceed one vehicle every 2 hours. As shown in Table 3-I.13, Alternative A is the only alternative where greater than 20 percent of marten habitat occurs within a 60 meter buffer from motorized routes. If traffic levels are no greater than those measured in the Lake Tahoe Basin study area, the results of

Zielinski et al (2007) suggest that the level of motorized routes in the action alternatives are unlikely to cause marten individuals to relocate from the area.

Table 3-I.13: Percent of preferred marten habitat occurring within 274 meters and 60 meters of motorized routes

Analysis Area	Acres of Habitat	Percent of Marten Habitat						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS within 60 m	42,632	5	25	18	18	20	14	12
Habitat on All Lands within 60 m*	44,571	5	25	18	18	20	14	13
Habitat on NFS within 274 m	52,560	20	68	58	58	56	51	44
Habitat on All Lands within 274 m*	59,381	18	67	57	57	56	51	46

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measure 4: Table 3-I.22 (riparian species and habitat section) shows the number of meadow sites with motorized routes under each Alternative. Alternative A includes motorized routes that occur within 163 meadow areas (GIS polygons). When existing surfaced roads are included, resulting in 16 percent of the meadows within the ENF containing motorized routes.

Alternatives B, D, C and Modified B affect incrementally fewer meadow polygons. Alternative E is the only Alternative that does not open routes within meadows, and will, therefore, have little effect upon this important component of marten habitat. Site specific assessment of routes occurring within meadows will take place under the monitoring plan, allowing for future adjustments to be made where needed to allow for proper hydrologic function.

Indicator Measure 5: The management of over-the-snow travel under the project alternatives may also affect marten populations through winter habitat changes (snow compaction) which can increase access into marten habitat for predators and competitors such as coyotes as well as displace marten directly. Alternatives A and D, which would allow wheeled motor vehicle over-the-snow travel on all open routes with either 12 or 24 inches of snow or more, would have the greatest likelihood of affecting marten in this manner. Areas where over-the-snow travel currently occurs are localized and limited, but this type of use could increase in the future with more substantial effects.

Alternatives B, Modified B, C, and E would limit wheeled motor vehicle over-the-snow travel to surfaced roads, providing for less motorized access within marten habitat during winter months and reducing associated effects.

Indicator Measure 6: As described in the section on old forest habitat, Alternative B designates 33 unauthorized routes which bisect patches of old forest habitat and 13 of these routes also occur within the Old Forest Emphasis Area land allocation. Unauthorized routes designated in Alternatives D, C, and Modified B and E have incrementally less effect fragmentation of patches of old forest habitats (Table 3-I.27).

Cumulative Effects – American Marten

An additional one to four percent of marten habitat is influenced by motorized routes within the larger cumulative effects analysis area that includes private lands within the Forest boundary as well as the routes already designated within the Rock Creek Recreational Trails area (Table 3-I.21). In 2001 and 2004, the Forest Service amended Sierra Nevada Forest Plans to better address the needs of old forest-associated species (USDA FS 2001a and 2004b,c). In this assessment, the following key risk factors were identified for marten in the Sierra Nevada: (1) habitat alternation, particularly the removal of overhead cover, large diameter trees, or coarse woody material; (2) livestock grazing and other activities that might reduce the availability of prey in meadows; and (3) the use of roads and associated human access.

On the ENF, several activities have influenced these risk factors for marten. Past timber harvest and more recent fuels reduction treatments have reduced important habitat components in marten habitats. Considering the projects listed in Appendix E, between 2001 and 2006, fuels treatments on NFS lands above 5,000 feet in elevation have occurred on about 1,500 acres a year, on average. These vegetation treatments have typically reduced habitat quality for marten by reducing canopy cover, structural complexity, and coarse woody material within treated units. At the larger landscape scale, these treatments may affect the size and connectivity of patches of high quality habitat. About 8,000 acres of fuels treatments are likely to occur within marten habitat over the next few years based upon the projects listed in the ENF Schedule of Proposed Actions (John Don't, Alder, Oski Bear, Firefox, O'leary's Cow, X-factor, and Smarty Jones projects) (see Appendix E). Over time, fuels treatments are expected to alter 20 to 30 percent of the landscape, with a resulting expectation that the amount of habitat removed by stand replacing wildfires will be reduced in response to these treatments (USDA FS 2004).

The CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted. The portion of these projects occurring within the marten's range has not been determined. Timber harvest on private lands is generally more intensive and does not typically maintain habitat suitability for martens.

Livestock grazing occurs on nine active grazing allotments on the ENF, totaling 32,177 acres of NFS and private lands. In some meadows, livestock grazing has reduced the suitability of meadow vegetation for microtine rodents and other marten prey (USDA FS 2001a). On the ENF, the impact of livestock grazing on meadows has been steadily decreasing as fewer allotments are grazed and as forage utilization levels are being controlled by stricter standards established by the Sierra Nevada Forest Plan Amendment. Nonetheless, the past and present effects of livestock grazing contribute to the effects of the project Alternatives upon meadow habitat and condition.

Ski area development has resulted in loss of marten habitat, but, until recently, martens have been relatively protected from most human disturbance because they occupy high elevation habitats. The growth of the human population and recreation opportunities over the past few decades in California has resulted in use of many previously undisturbed high-elevation habitats by OHVs (Zielinski et al 2007)

Direct and indirect effects of the project alternatives, as described in the previous section, cumulatively contribute to each of the risk factors identified for marten (Alternative A to the greatest extent and Alternative E to the least extent). Because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is a high degree of uncertainty about future route proliferation and associated cumulative impacts upon marten.

Alternatives B, Modified B, C, D and E also contribute cumulatively to the disturbance associated with habitat alteration from fuels treatments and habitat alteration from livestock grazing in meadows. These alternatives do not result in a loss of habitat (no route construction), but may influence marten habitat use within 38 to 59 percent of habitat within the analysis area, depending upon the alternative selected (Alternatives E and A, respectively). This influence, combined with fuels treatment and livestock grazing effects upon marten habitat, could be substantial. IRAs and adjacent wilderness areas may become increasingly important as the cumulative effect of fuels treatment activities expand within other portions of marten habitat.

The American marten occupies most of its historic range in the Sierra Nevada and is well distributed on the ENF, though trends in populations or habitat are not well known (Kucera et al.

1998). Alternative A presents the greatest risk of contributing to adverse cumulative effects upon marten habitat and populations, and Alternatives B or Modified B, C, and D result in slight, but progressively lower risk. Alternative E contributes the least to cumulative effects because open route densities in marten habitat are lowest, and motorized routes occurring in meadow habitats would not be designated. The elimination of motorized routes in IRAs in Alternative E provides larger areas (IRAs) where habitat is not dissected by routes and human disturbance is likely to be lower. Considering the proportion of marten habitat influenced by motorized routes and projections for future increases in recreation uses and OHV activity, the alternatives could result in cumulative impacts when combined with other factors affecting marten habitat (Zielinski et al. 2007). At present there is no indication that the magnitude of these combined effects will result in a loss of viability or lead to a trend toward Federal listing for the American marten under any alternative (see project Biological Evaluation).

Pacific Fisher

Based upon a review of the literature, fisher were found likely to be affected by the same road and motorized trail-associated factors as marten: trapping, poaching, collisions, displacement or avoidance, habitat loss or fragmentation, snag reduction, down log reduction, edge effects, movement barrier or filter, and route for competitors (Gaines et al 2003, Buskirk and Rugerrio, 1994). The current absence of fisher from the ENF eliminates these risk factors, but this analysis will be conducted to analyze impacts of the alternatives to fisher if populations were to be re-established on the ENF.

Trapping, Poaching and Collision: Neither trapping nor collisions on routes open in the project alternatives would be expected to present measurable risks (see discussion for American marten). Higher speed and traffic volume roads, on the other hand, represent a substantial threat to populations (USFWS 2004). The increased opportunity for poaching provided by increased public access may represent a substantial risk for fisher, based upon findings in the southern Sierra Nevada. Of nine recently documented fisher mortalities, two were suspected of being the result of poaching (USFWS 2004).

Movement Barriers, Habitat Loss and Fragmentation, Edge Effects, Displacement or Avoidance: The loss and fragmentation of suitable habitat by roads and development is thought to have played a significant role in both the loss of fishers from the central Sierra Nevada and its failure to recolonize this area (USFWS 2004). Campbell (2004, *in* USFWS 2004) found that sample units within the central and southern Sierra Nevada region occupied by fishers were negatively associated with road density. This relationship was significant at multiple spatial scales (from 494 to 7,413 acres). The USFWS (2004) concluded that, “vehicle traffic during the breeding season in suitable habitat may impact foraging and breeding activity” and that “hiking, biking, off-road vehicle and snowmobile trails, may adversely affect fishers.” Dark (1997) found that fishers in the Shasta-Trinity National Forest used landscapes with more contiguous, unfragmented forests and less human activity.

Snag and Down Log Reduction: Snags and large downed logs are important habitat components for fisher, creating resting and den sites. Activities that remove coarse woody debris are likely to degrade fisher habitat (Buskirk and Ruggieero 1994). As previously described, hazard tree removal along roads will reduce numbers of snags and down logs within a distance of about 60 meters alongside roads. This, however, is probably incidental to the human disturbance factors that are likely to influence fisher use of habitat within an even greater distance of motorized routes.

Direct and Indirect Effects for All Alternatives – Pacific Fisher

Indicator Measure 1: Although fisher are thought to be absent from the central Sierra Nevada at present, if the species were to recolonize habitat on the ENF, areas with lower densities of open motorized routes and associated human disturbances, would be expected to present less risk to fisher. The proportion of NFS lands with low density of motorized routes (less than 2 miles per square mile) is therefore used as a measure of relative effects of the Alternatives on fisher.

Alternative A results in about 32 percent of the project area having motorized route density below two miles per square mile (based on a scale of one square mile). Alternatives B or Modified B, C, and D result in 45, 48, and 51 percent, respectively, of NFS lands having route densities below 2 miles per square mile. Alternative E increases this percentage to 56 percent of the project area.

Indicator Measure 2: Access to dispersed recreation sites, described in Section one is highest in Alternative A and progressively decreases in Alternatives B, C, D, Modified B and E. Human-caused disturbance and mortality risks correspondingly decrease between these alternatives.

Indicator Measure 3: Fisher habitat occurs in the same vegetation types mapped for the California spotted owl and northern goshawk, and, as described for spotted owls and goshawks, the quality of fisher habitat will be reduced in proximity to open motorized routes due to hazard tree removal, wood cutting, and edge effects to habitat.

Changes in fisher habitat use adjacent to roads and trails have not been studied, but it is likely that, similar to marten, routes may displace fisher or result in habitat avoidance for distances far greater than 60 meters. At minimum, habitat modification effects are likely to extend a distance of 60 meters from routes, affecting habitat quality as described for the California spotted owl or northern goshawk, and shown in Table 3-I.14.

Table 3-I.14: Percent of fisher habitat that occurs within 60 meters of motorized routes

Analysis Area	Acres of Habitat	Percent of Fisher Habitat						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS	281,531	5	21	15	16	15	13	12
Habitat on All Lands*	373,903	5	23	18	19	18	17	15

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measures 4-5: Do not apply to this species.

Indicator Measures 6: The effects of specific unauthorized routes upon patches of old forest habitat and upon the old forest land allocation, are described in the section on old forest habitat, and shown in Table 3-I.27.

Cumulative Effects – Pacific Fisher

Appendix E provides a list and description of past, present, and reasonably foreseeable projects on the ENF and private lands within the Forest boundary. In 2004, the USFWS determined that listing of the West Coast population of the fisher was warranted, and identified the following primary threats from activities on NFS lands: (1) loss and fragmentation of habitat due to timber harvest and hazardous fuels reduction; (2) increased predation resulting from canopy cover reductions; (3) mortality from vehicle collisions; and (4) increased human disturbance.

On the ENF, past timber harvest and more recent hazardous fuels reduction projects have reduced large trees, canopy cover, structural complexity, and coarse woody material within treated units.

Approximately 57,500 acres of forest thinning has occurred through timber sales over the past 10 years (Appendix E). Between 2001 and 2006, fuels treatments have occurred annually on an average of about 5,300 acres. These fuels reduction treatments have reduced habitat quality for fisher and potentially affected the size and connectivity of patches of high quality habitat. About 20,000 acres of fuels treatments are likely to occur over the next few years based upon the projects listed in the ENF Schedule of Proposed Actions. Over time, fuels treatments are expected to alter 20 to 30 percent of the landscape, with a resulting expectation that the amount of habitat burned by stand replacing wildfires will decline in response to these treatments (USDA FS 2004).

Recreation use has increased and is expected to continue to increase on the ENF (see Recreation section Affected Environment), resulting in greater likelihood and magnitude of human disturbance to wildlife. OHV use has been increasing at an even more rapid pace than other forms of recreation, based upon State figures for OHV sales (see Recreation section). If fisher were to recolonize or to be reintroduced on the ENF, project alternatives would contribute to these past and current conditions with added displacement from noise and human activity, fragmentation of habitat, and direct mortality (from poaching or other human-caused factors – Alternative A to the greatest extent and Alternative E to the least extent). Because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is a high degree of uncertainty about future route proliferation and associated cumulative impacts upon fisher. The action alternatives do not result in a loss of habitat (no route construction), but noise and traffic disturbance would influence habitat use and availability where fisher is present. This influence, combined with fuels treatments and increasing recreation activity, could affect the potential for fisher to re-occupy habitat on the ENF.

Much of the fisher’s historical habitat and range have been lost, and habitat continues to be threatened with further loss (USFWS 2004). In addressing the effects of roads upon fisher, the USFWS concluded that, road-related effects on low density carnivores like fishers “are more severe than most other wildlife species due to their large home ranges, relatively low fecundity, and low natural population density.” Thus, the combined effect of the project alternatives and current levels of hazardous fuels reduction treatments are likely to result in adverse cumulative effects. The greatest influence upon fisher habitat occurs under Alternative A and progressively lower levels of impact occur under Alternatives Modified B, B or C, D, and E. Since fisher are presumed to now be absent from the ENF, these cumulative effects to habitat will not result in a trend toward Federal listing or loss of viability for the fisher (see project Biological Evaluation).

Coniferous Forest Birds

A review of the literature shows that a number of forest bird species, particularly those associated with dense, mature forest habitats such as the brown creeper and hermit thrush, are sensitive to habitat fragmentation and human intrusion. These species may be affected by the following road and trail-associated factors: displacement or avoidance, snag reduction, habitat loss or fragmentation, edge effects, and routes for competitors or predators (Gaines et al. 2003).

Displacement or Avoidance: Human intrusion can be a serious problem for birds because it can cause displacement, prevent access to resources, and reduce reproduction and survival (Gutzwiller et al. 1998). Van der Zande et al. (1984 and 1980) found that the density of woodland bird species declined as recreation intensity increased, and that increases in traffic intensity had a larger disturbance effect where traffic intensity is low than where traffic intensity is high. Foppen and Reijnen (1994) found that roads reduced forest bird reproduction within a distance of 200 meters from main roads. Van der Zande (1980) documented lower numbers of field nesting birds within a distance of 450 meters from a low use road.

Habitat Loss and Fragmentation, Edge Effects, Route for Predators: Many forest bird species require a relatively closed canopy and a complex forest structure, including an abundance of trees of different age-classes as well as dead, dying, and downed trees (CalPIF 2002). Roads and trails result in forest fragmentation by dividing large landscape patches into smaller patches, thereby decreasing the amount of interior forest habitat and increasing the amount of edge habitat. Interior forest bird species, such as brown creepers and hermit thrushes, are often sensitive to changes in canopy closure and habitat fragmentation (Keller and Anderson 1992, Rosenberg et al. 1999), such as those that could result from route networks.

Roads and trails that bisect forest habitats create habitat edges which often facilitate nest parasitism or predation. Miller et al. (1998) found that in forest ecosystems bird species composition was altered adjacent to trails, and that nest survival increased as distance from trails increased. Paton (1994) reviewed studies on the influence of edge habitat on nest predation and found that the majority of studies showed elevated levels of predation near habitat edges.

Snag Reduction: Dead trees are important to forest birds for a variety of reasons. Many birds require large snags (Vaux's swift and pileated woodpecker) or dead trees (brown creeper and hairy woodpecker) for nesting (the needs of these species are addressed more specifically in the Section on Cavity Nesting Birds). Others require downed wood or dead trees for foraging, or require the presence of very tall, dead trees in their territories for perching (olive-sided flycatchers). Reduction of snags and down logs is expected to occur along open roads as a result of removing hazard trees (trees which pose a risk of falling upon a road or facility), and as a result of woodcutting by the public. In order to manage roadside hazards, few snags would be expected to be retained within an area of about 60 meters (200 feet) alongside roads open for public use. Habitat quality within these roadside corridors would be reduced for cavity-dependent bird species associated with mature forest habitat. This may, however, be incidental to the displacement and avoidance factors that appear to influence some species' use of habitat within a distance greater than 60 meters from motorized routes.

Direct and Indirect Effects for All Alternatives – Coniferous Forest Birds

Indicator Measure 1: As described in the section on old forest habitat, the average size of an undissected old forest patch increases incrementally between Alternatives A, B, Modified B, C, D and E. It increases by about 33 percent between Alternative A and Alternatives B or Modified B, and by another 14 percent between Alternatives B or Modified B and Alternative E (Table 3-I.5). Large habitat areas are particularly important for interior forest bird species because nest survival has been shown to increase as distance from trails increased. Alternative E creates the least amount of edge habitat within old forest patches. Impacts associated with old forest habitat fragmentation (nest predation, changes in species composition) decrease incrementally from Alternative A to B, Modified B, C, D and E.

Indicator Measure 2: As described for other old forest associated species, Alternative A provides access to substantially greater numbers of dispersed recreation sites. Densities of woodland bird species have been found to decline as recreation intensity increases. Alternative A is therefore expected to have the greatest influence upon coniferous forest birds and alternatives B, C, D, Modified B and E, are expected to incrementally reduce this impact.

Indicator Measure 3: Noted decreases in bird abundance may be due to the physical presence of a road or trail (habitat loss and edge effects), to the noise and disturbance associated with motorized use, or both. It is therefore difficult to separate the effects associated with displacement and avoidance, habitat loss and fragmentation, edge effects, and increased predation. Effects upon birds associated with old forest habitats have therefore been represented by a single measure. Based on available literature, a "zone of influence" of 200 meters from motorized routes is used to represent the area within which interior forest-associated birds are likely to be influenced by any of these factors (Gaines et al. 2003). CWHR 4D, 5D, and 5M size and density classes were used to represent the denser, larger size class stands likely to provide preferred habitat for bird species that are associated with mature forest habitats. Using this approach, the proportion of mature forests habitat occurring within a disturbance zone of 200 meters alongside motorized routes is shown in Table 3-I.15. Thresholds associated with this measure have not been established, but relative changes in habitat effectiveness can be evaluated and compared.

Existing surfaced roads are influencing about 15 percent of the mature forest habitat throughout the Forest. Routes open for motorized use in Alternative A would affect an additional 43 percent of habitat resulting in 58 percent of the mature forest habitat on the Forest being influenced by motorized routes in Alternative A (Table 3-I.15). Studies indicate varying effects within this zone, and the actual degree of negative impact is likely to be quite variable depending upon site-specific factors such as vegetative cover and the frequency of road use. With the high proportion of habitat influenced, however, mature forest associated bird species that are sensitive to disturbance and edge effects, such as the brown creeper and hermit thrush, might experience lower abundance and productivity.

Alternatives B or C, Modified B or D, and E result in progressively lower proportions of mature forest habitat that is influenced by motorized routes (Table 3-I.15). In these alternatives, the proportion of mature forest habitat occurring within a 200-meter zone of influence ranges from 44 percent to 38 percent.

Table3-I.15: Percent of dense, mature forest habitat that occurs within 200 meters of motorized routes

Analysis Area	Acres of Habitat	Percent of Habitat Affected						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS	140,609	15	58	44	42	44	42	38
Habitat on All Lands*	167,228	13	63	50	49	50	47	44

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measures 4-5: Does not apply to this section.

Indicator Measure 6: The effects of individual unauthorized routes upon patches of old forest habitat are described in the section on old forest habitat, and shown in Table 3-I.27. The extent to which unauthorized routes occur in meadows is shown in Table 3-I.30. Of the action Alternatives, Alternative B designates the greatest number of unauthorized routes within old forest habitat and within meadows, Alternative D, C, and E and Modified B designate incrementally fewer unauthorized routes within these important marten habitats. Alternatives C, E and Modified B do not designate any unauthorized routes in meadows.

Cumulative Effects – Coniferous Forest Birds

An additional five to six percent of mature forest habitat is influenced by motorized routes within the larger cumulative effects analysis area that includes private lands within the Forest boundary as well as the routes already designated within the Rock Creek Recreational Trails area (Table 3-I.15). More than 50 percent of mature forest habitat occurs within an area subject to the influence of motorized routes in Alternatives A, B, and C, and the remaining alternatives influence only slightly less.

The draft coniferous forest bird conservation plan prepared by California Partners in Flight identifies fire exclusion and logging as the primary threats to birds in California's coniferous forests (CalPIF 2002). Fire suppression may reduce the abundance of open forest bird species as forests close in, as well as the abundance of ground or shrub-foragers. The plan suggests that past even aged logging practices, which have homogenized forest structure and increased edge, have decreased the abundance of almost all permanent residents and half the migrant bird species in coniferous forests (Hejl 1994).

Within the analysis area, hazardous fuels reduction and associated timber harvest have occurred on approximately 57,500 acres of NFS land over the past decade (Appendix E). These treatments have generally simplified forest structure by reducing canopy cover and understory layers, thereby altering the quality of mature forest habitat for many bird species. Since hazardous fuels treatments emphasize reduction or elimination of shrub cover, which provides an important habitat component for many forest birds, for several years these treatments reduce habitat availability for forest birds species associated with dense canopies or understory layers. Forest thinning treatments are anticipated to be the primary activity that will alter mature forest habitat on the ENF based upon the Forest's Schedule of Proposed Actions. About 20,000 acres of hazardous fuels reduction treatments are anticipated to occur over the next few years. Forest thinning projects will continue to occur on an estimated 5,000 acres per year, based upon the acreage treated in 2005 and 2006. These treatments will reduce canopy cover and simplify forest structure, but will maintain at least 40 percent cover and, over time, it is anticipated that they will reduce the amount of habitat burned in stand replacing wildfires (USDA FS 2004).

CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted. Timber harvest on private lands is generally more intensive and does not typically maintain habitat suitability for birds associated with mature forest habitat.

Fire suppression itself has also resulted in decreased structural diversity, affecting many coniferous forest birds. Bird species that require openings in the canopy (e.g. olive-sided flycatcher) and high shrub cover (e.g., green-tailed towhee, fox sparrow, Townsend's solitaire) are declining, with local extirpations having been observed in some parts of California (CalPIF 2002). The approximately 20,000 acres that have burned in wildfires on the ENF since 2001 have increased diversity across the broad landscape, but the intensity and large size of these fires has removed considerable habitat for forest birds without providing a desirable distribution of small openings within forested habitats.

Project alternatives will contribute to the cumulative effects of these activities that have resulted in changes to the amount and quality of mature forest habitat for birds. At present, fuels reduction treatments and associated logging are identified as the predominant management actions affecting coniferous forest habitat for birds on the ENF. Project alternatives contribute to these effects by potentially influencing nesting suitability for some interior forest bird species within an estimated 38 to 58 percent of mature forest habitat (Alternatives E and A, respectively). Considering all the indicator measures, for those forest bird species sensitive to human intrusion or forest fragmentation, the combined effects of the project alternatives and current levels of forest fuels treatments will result in the greatest habitat influence under Alternative A and would decline incrementally under Alternatives B, Modified B or C, D and E. Because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is a high degree of uncertainty about future route proliferation and associated cumulative impacts under this alternative.

Summary of Effects to the Old Forest Species and Habitats Group

Effects of project Alternatives contribute to past reductions in the quantity and quality of old forest habitat on the Eldorado National Forest. In particular, the density of routes open to motorized use in the alternatives influences old forest habitat quality through fragmentation of habitat patches, increased amounts of edge and increased potential for disturbance and displacement of species. Higher amounts of edge habitat has been shown to increase nest predation rates and to result in lower productivity and survival for a number of interior forest birds. Forest fragmentation is suspected of altering habitat suitability for fisher and marten. Old forest habitat connectivity, as measured by the average size of undissected old forest habitat patches, declines by about 55 percent in Alternative A and to an incrementally lesser extent in Alternatives B and Modified B, C, D, and E.

Alternative A influences a substantial portion of the habitat available to old forest-associated species. More than a quarter of key spotted owl habitat (the PAC land allocation) occurs within 60 meters of an open motorized route, and over 60 percent of marten habitat is within a zone where marten activity may decline in response to motorized routes. The effect of project alternatives upon old forest habitats and species declines incrementally under the remaining alternatives, with Alternatives B and Modified B and Alternatives C and D being very similar in the degree to which they influence species habitats. Alternative E influences the least amount of old forest habitat with motorized routes and for marten is likely to provide greater habitat effectiveness by eliminating open routes within meadows and in high elevation areas identified as IRAs. Alternative E is least like to result in adverse cumulative effects to old forest habitat and species, followed by Alternatives D, C or Modified B, B and A.

Wide-Ranging Carnivores Group

Many large and mid-size carnivores are unique in their response to human-caused habitat changes due to their huge spatial requirements and their sensitivity to the effects of landscape patterns, including such factors as road and edge density (Buskirk and Zielinski 2003, Van Dyke 1984). While some mammalian carnivores, such as coyotes, have adapted to the presence of humans and human activities, for others, such as the wolverine, human activities are documented to have significant adverse impacts (Claar et al. 1999). Due to their large home range requirements, specialized habitat needs, low reproductive potential, and inability to disperse across areas of unacceptable habitat, fisher and wolverine, and to a lesser extent marten, are susceptible to habitat fragmentation and population isolation (Joslin and Youmins 1999). Fisher and marten are wide-ranging carnivores that are also old forest habitat specialists and have been addressed in the old-forest habitat section.

Black Bear

A review of the literature shows black bear are affected by the following road and trail-associated factors: collisions, hunting, poaching, negative human interactions, and displacement or avoidance (Gaines et al. 2003, Brody and Pelton, 1989).

Collisions, Hunting, and Poaching: The level of reported bear collisions with vehicles is low (CDFG 2004), and most likely occur on higher speed surfaced roads. Collisions are very unlikely to occur on the low speed native surface routes being evaluated in this project.

Greater human access will increase opportunities for hunting as well as poaching of bear. Bear hunting pressure is controlled through season limits which are established by the CDFG, to ensure that hunting does not result in statewide population declines (CDFG 2004). Greater hunting access on the ENF could influence local black bear populations, but “monitoring of the population statewide has not produced any evidence of subpopulations declining in any part of the State” (CDFG 2004).

Since black bear populations are currently estimated to be stable or increasing, and since population structure was not found to differ between hunted and unhunted populations in other parts of the State (CDFG 2004), there in no evidence that hunting pressure is likely to result in population declines on the ENF. CDFG estimates illegal kill of black bear as ranging from zero to 25 percent of the legal harvest, and has determined that the legal harvest and estimated illegal kill together “will not have significant negative effects on the State’s bear resource (CDFG 2004).”

Given these findings, indirect effects associated with increased hunter success or increased poaching are not expected to substantially affect black bear populations on the ENF.

Negative Human Interactions: As human access and recreation levels increase, so does the potential for negative human interactions with bears. On the ENF, bear problems have primarily occurred at developed campgrounds already accessed by surfaced roads. As dispersed campsites grow in popularity and use, however, negative human interactions with bears could occur at these sites (Claar et al, 1999, Wisdom et al. 2000). Various public education and food storage programs have been designed to reduce conflicts with bears. The outcome of chronic negative interactions with humans is often depredation killing of the offending bear, and thus a loss of individuals from the population. These losses are not currently a substantial source of mortality, and indirect effects of the Alternatives associated with increased depredation losses are not expected to be a major concern for black bear on the ENF.

Displacement or Avoidance: Habitat security is an important aspect of black bear habitat. Brody and Pelton (1989) found that as road density or traffic level increases, the frequency of bears crossing roads decreased. The density of roads is thought to be a factor in selection of home ranges by black bear, particularly in areas where black bear are hunted. Brody and Pelton (1989) suggested that black bear shift their home ranges in response to road densities exceeding threshold levels. They suggested that bears may be able to adjust movement patterns to minimize risks associated with road traffic, as long as road densities remain relatively low. However, as road densities become high, the response may be to shift home ranges into areas of lower road density. Hurley et al. (1981) suggested that preferred black bear habitat in the Sierra Nevada would have road densities below 0.5 miles per square mile. In Montana, back bears were found to avoid habitat within 274 meters of open roads (Kasworm and Manley 1990).

Direct and Indirect Effects for All Alternatives – Black Bear

Indicator Measure 1: Thresholds associated with motorized route densities are difficult to establish, but Hurley et al. (1981) assumed preferred habitat to have densities below 0.5 miles per square mile, and moderate capability habitat to have densities below 5 miles per square mile. To evaluate the extent to which project alternatives may influence black bear habitat, including effects from hunting, poaching, and displacement, the density of motorized routes across the Forest was calculated using a 0.9 km radius circle (one square mile) moving window.

Alternative A results in nine percent of the project area having an open route density of zero, which meets the route density criteria for “high capability” habitat. Sixty percent of the project area would have a route density below four mile per square mile and be below the density limit for moderate capability habitat (Table 3-I.3). Within the approximately 40 percent of NFS lands where road density would exceed four miles per square mile, road and trail use is more likely to influence the selection of home ranges by black bear or potentially displace them from otherwise suitable habitats.

Alternatives B, Modified B, C, and D, are similar in that they would result in 12 to 13 percent of NFS lands with open route densities below 0.5 miles per square mile. Alternative E would provide 18 percent of NFS lands with route densities below 0.5 miles per square mile (assumed to provide preferred habitat). Alternative E almost doubles the amount of forest with very low road densities compared to alternative A (Table 3-I.3). This is likely to result in substantial improvement of habitat conditions for wide-ranging carnivores such as black bear. The percent of the project area with route densities below four miles per square mile (assumed to provide moderate capability habitat) would range from 88 percent (Alternative E) to 80 percent (Alternative B) of the project area.

Alternative E benefits wide-ranging carnivores, such as black bear, to a greater degree than the other action alternatives since a substantially larger portion of the Forest would have road densities below 0.5 miles per square mile under this Alternative. Under Alternative E, 18 percent of the Forest, including the large blocks of habitat within IRAs, would have road densities below 0.5 miles per square mile, providing preferred conditions for black bear habitat (Hurley et al. 1981, Brody and Pelton 1989). Areas free of motorized traffic will provide greater security from hunting pressure and include areas within which bear can adjust their habitat use patterns to avoid human intrusion.

Indicator Measure 2: Open routes in Alternative A would provide human access to a relatively high number of dispersed recreation sites across the Forest, resulting in the highest magnitude of effect associated with human disturbances. Alternatives B, C, Modified B, D, and E, have progressively fewer dispersed recreation sites accessible by public wheeled motor vehicles, reducing the effects associated with human disturbances.

Indicator Measure 3: As previously described, studies indicate black bear use of habitat declines within a distance of 274 meters from roads. For this analysis, a "zone of influence" of 274 meters from motorized routes was mapped, and the proportion of black bear denning and cover habitat occurring within this zone was analyzed (Table 3-I.16). This index is useful as a relative measure of the potential effects of displacement and avoidance under the Alternatives. Thresholds associated with this measure have not been established, but relative changes in habitat effectiveness for black bear can be evaluated and compared.

Alternative A results in 47 percent of black bear denning and cover habitat occurring within a motorized route's zone of influence (about 15 percent as result of surfaced roads). As described above, black bear are likely to exhibit some degree of habitat avoidance within this zone. Motorized uses under Alternative A are not restricted during the wet weather period when disturbance to black bear den sites could occur.

Alternatives B or Modified B, C, D, and E result in progressively lower proportions of black bear habitat being influenced by motorized routes (38 percent in Alternatives B and Modified B to 30 percent in Alternative E). All of these Alternatives, however, have at least a moderate degree of influence upon black bear habitat. The wet weather closure in these alternatives provides a greater degree of protection to bear den sites that might be disturbed by motorized use of routes.

Table 3-I.16: Percent of black bear denning and cover habitat occurring within 274 meters of a motorized route

Analysis Area	Acres of Habitat	Percent of Black Bear Habitat						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS	457,096	15	47	38	38	36	34	30
Habitat on All Lands*	670,009	14	49	43	44	42	41	38

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measure 4: Black bear, along with deer and willow flycatcher, are selected as MIS to represent the condition of meadow habitats. Meadows are an important component of black bear habitat. Effects to meadow habitat are similar to those described for American marten and mule deer.

Indicator Measure 5: Does not apply to Black Bear.

project alternatives combined with other past, present, and future activities would result in substantial adverse cumulative effects to the black bear population on the Forest.

Wolverine

Human access is suspected of being a primary factor affecting use of habitat by wolverine (Banci 1994, May et al. 2006). A review of the literature indicates that wolverine are affected by the following road and trail-associated factors: collisions, trapping, disturbance at a specific site, and displacement or avoidance (Gaines et al. 2003, Banci 1994).

Collisions and Trapping: Limitations on body-gripping traps in California, as well as the remoteness of habitats likely to be occupied by wolverine on the ENF, make trapping or collisions on open routes unlikely sources of mortality on the ENF.

Disturbance at Natal Dens: Locations of wolverine natal dens, or whether they exist on the ENF, is unknown, but such sites would most likely occur on talus slopes or rocky areas in deep snow above treeline (Banci 1994, USDA Forest Service 2001a, Aubrey et al. 2007). Wilderness areas encompass the majority of this alpine habitat on the ENF, minimizing the likelihood of motorized routes occurring within proximity of natal den sites.

Displacement or Avoidance: Habitat fragmentation and human access are suspected of being primary factors affecting wolverine use of habitats (Banci 1994, Krebs et al. 2007). Wolverines appear to not tolerate human presence and activity within habitats. May et al. (2006) found that the presence of human development formed a more important factor in home range selection than did vegetation or habitat type. On the ENF, subalpine and alpine areas provide some of the only large areas with low human development or activity. Increased access and recreation use in these areas is therefore likely to have the greatest impact on wolverine.

Direct and Indirect Effects for All Alternatives – Wolverine

Indicator Measure 1: Since wolverine display a strong preference for areas remote from human development or activity, the proportion of NFS land, and the proportion of the Old Forest Emphasis Area, remaining without any density of motorized routes provides a useful measure of relative benefits of the Alternatives for wolverine (Tables 3-I.3 and 3-I.5).

The existing environment (the presence of Highways, State and County roads, and population centers) substantially influences wolverine habitat. Remote alpine and subalpine areas are the most likely to be occupied by wolverine on the ENF. Along with surfaced roads already designated for public wheeled highway-licensed motor vehicle use, Alternative A results in about 9 percent of the project area and 20 percent of the Old Forest land allocation having a route density of zero. The greater amount of motorized access that is provided to high country portions of the Forest will increase human presence and lower the likelihood for habitat to be occupied by wolverine. As seen in Maps 9 through 13 at the end of Chapter 3, the density of routes in the high country and adjacent to Wilderness areas in highest in Alternative A.

Alternatives B, Modified B, C, and D result in 12 to 14 percent of the project area, and 23 to 25 percent of the Old Forest land allocation, having a route density of zero. Alternative E has the least impact on wolverine, resulting in 18 percent of the project area and 31 percent of the Old Forest land allocation with zero road density, and benefiting habitat connectivity by not designating routes within IRAs. The IRAs occur primarily in high elevation areas surrounding the Desolation and Mokelumne Wilderness areas, and as such, increase the connectivity and effectiveness of habitat for wolverine under Alternative E. As seen in Maps 10 through 13, for the Action Alternatives, the density of routes in the high country and adjacent to Wilderness areas are highest in Alternatives B and Modified B, and progressively less in Alternatives C, D, and E.

Indicator Measures 2-6: Do not apply to Wolverine.

Cumulative Effects - Wolverine

When completing its status review of the Pacific fisher, the USFWS concluded that road-related effects on low density carnivores like fishers “are more severe than most other wildlife species due to their large home ranges, relatively low fecundity, and low natural population density.” These same concerns would appear to be applicable to the wolverine.

alternatives upon Sierra Nevada red fox (Tables 3-I.2 and 3-I.5). Direct and indirect effects of the project alternatives are essentially the same as those described for the wolverine.

Indicator Measures 2 and 3: Do not apply to Sierra Nevada red fox.

Indicator Measure 4: Knowledge of habitat requirements of Sierra Nevada red fox is limited, but available literature indicates that the species may be even more strongly associated with and dependent upon meadow habitats than the American marten. Increased concentration of human use in meadows (resulting from motorized access), may affect Sierra Nevada red fox. Routes open for motorized use in Alternative A would occur within 163 meadow areas (polygons), potentially limiting or displacing Sierra Nevada red fox use of these meadows. When combined with existing surfaced roads, 197 meadow areas are affected by routes (Table 3-I.20).

Alternatives B, D, C, Modified B and E affect progressively fewer meadow areas than does Alternative A (Table 3-I.20). Alternative E is the only alternative that does not open routes within meadows, and thus provides the greatest benefits to Sierra Nevada red fox in this regard.

Indicator Measures 5: Does not apply to Sierra Nevada red fox.

Indicator Measure 6: See discussion for the American marten and Table 3-I.30.

Cumulative Effects – Sierra Nevada Red Fox

The Sierra Nevada red fox is currently considered “extremely endangered” and its population size, extent, and trend are unknown (CDFG 1996). Cumulative effects are similar to those described for the wolverine. There is no information to determine that motorized use in any of the Alternatives is a factor likely to result in a trend toward Federal listing or loss of viability for the Sierra Nevada red fox. The EIS for the Sierra Nevada Forest Plan Amendment (USDA FS 2001a) concluded however, that based upon historic descriptions of habitat and behavior, any actions taken to minimize new and open roads to limit human encroachment into the higher elevations, and to improve conditions of high elevations meadows, will likely benefit the Sierra Nevada red fox. Alternative E contributes the most toward improved conditions for this species since routes are not open for use within IRAs or within meadows.

Summary of the Effects to the Wide-Ranging Carnivores Group

Areas with low human presence are likely to provide the most effective habitats for wide-ranging carnivores such as fisher, wolverines, Sierra Nevada red foxes, black bears, and mountain lions. Areas with concentrated human presence may be lost as habitat (or become population sinks) for these species (Van Dyke et al. 1986, Claar et al. 1999, Wisdom 2000). Given these factors, the direct and indirect effects of project alternatives combined with additional human activities may result in adverse cumulative effects to wide-ranging carnivores.

In Alternative A, nine percent of the project area has a route density of zero (based upon a 0.9 km moving window area); this increases to 18 percent of the project area in Alternative E. In Alternative A, more than 30 percent of black bear cover and denning habitat occurs within a zone where black bear are likely to be influenced by motorized routes. Adverse effects are greatest under Alternative A, where route densities exceed four miles per square mile over 40 percent of the project area, and decrease in the Action Alternatives, where route densities exceed four mile per square mile on 12 to 20 percent of the project area (Alternatives E and B or Modified B, respectively). Of the action alternatives, Alternative E contributes the most toward improved conditions for wide ranging carnivores and Alternatives B and Modified B contribute the least based upon route densities. Since high elevation habitat connectivity and function is improved by not designating routes in IRAs and providing undisturbed meadow habitats, Alternative E, in particular, improves conditions for the wolverine and Sierra Nevada red fox.

Ungulates Group

Mule Deer

Mule deer are likely to be affected by the following road or motorized trail-associated factors: collisions, hunting, poaching, displacement or avoidance, disturbance at a specific site (Gaines et al. 2003, Barrett et al. 2004).

Collisions: Deer mortality from vehicle collisions on highways and other surfaced roads is often substantial, but collisions on native surface routes with lower speeds and traffic volumes, such as the routes that are being evaluated in this project, is probably insubstantial.

Hunting and Poaching: Greater human access can increase opportunities for hunting as well as poaching of deer. Since hunting levels for deer are controlled through hunting zone quotas and tag limits established by CDFG, an increase in hunting opportunity or hunter success is unlikely to impact deer populations (deVoss et al. 2003). Hunting limits also take into account estimates of the amount of illegal kill and road kill occurring. Levels of illegal harvest are not presently described as a significant source of mortality for deer herds on the ENF (CDFG 2003, CDFG 1998). Nonetheless, Barrett et al. 2004, considered legal and illegal harvest to be one of four factors potentially having an influence on the Pacific deer herd population.

Displacement or Avoidance: Deer responses to recreational uses have not been studied in detail, making it difficult to make reliable inferences (Barrett et al. 2004). In general, however, studies show that mule deer will move away from, or flush, from an approaching person and will usually allow a person in or on a vehicle to get closer than a person on foot (Freddy et al. 1986, Wisdom et al. 2005). Wisdom et al. found that mule deer showed little measurable flight response to experimental OHV treatments but cautioned that deer may well be responding with fine-scale changes in habitat use (i.e. avoidance), rather than substantial increases in movement rates and flight responses. Several studies have found that mule deer avoid areas in proximity to roads. Deer avoid primary roads more than secondary or tertiary roads and also avoid roads more in open habitats as opposed to areas with vegetative or topographic cover (deVos et al. 2003).

The displacement distances vary between 200 and 800 meters in various studies, depending upon the road type and traffic level, and the surrounding habitat (Perry and Overly 1977, Rost and Bailey 1979, Johnson et al. 2000, Livezey 1991). Main roads were found to reduce deer use up to 0.5 miles (800 m), whereas secondary and primitive roads reduced deer densities from between 200 to 400 meters in these studies. Additional variables such as the amount and frequency of traffic, and the spatial distribution of roads in relation to deer use, influence the degree of negative effects that roads have on deer use in forested habitats (Perry and Overly 1977, Johnson et al. 2000, deVos et al. 2003).

Where disturbance causes deer to avoid areas within preferred habitats, animals may be forced into less preferred or lower quality habitats. Such shifts, particularly if repeated, can result in adverse impacts to the energy balance of individual deer and ultimately can decrease population productivity, especially on winter ranges (deVos et al. 2003).

Disturbance at a Specific Location: Certain special micro-habitat features are important to deer in forested habitats, the primary special feature being fawning cover (deVoss et al. 2003). Although fawning cover can occur in any forest structural class, the Sierra Nevada meadows and associated aspen habitats are often regarded as key fawning areas and population centers critical for female deer trying to nurture young fawns during the summer months. These habitats comprise a relatively small amount of geographic area, while serving a critical role in providing areas of high quality forage, cover, and water in proximity (CDFG 1998). Perry and Overly (1977) found that even native surface roads significantly reduced deer use of adjacent meadow habitats to one-half mile away, indicating that motorized routes through meadow habitats on the

ENF are likely to reduce the suitability of these important habitats for deer. The quality of meadow habitat can also be reduced by the effects that roads and trails can have on meadow hydrology and vegetation (refer to the section on riparian habitats and species).

Direct and Indirect Effects for All Alternatives – Mule Deer

Indicator Measure 1: Historically, habitat use by deer has been modeled to decline as open road density increases (Thomas et al. 1979, Witmer et al 1985). Factors such as hunting pressure, poaching, and other human disturbances are also likely to correlate with open road densities. Based upon such models, the ENF LRMP established a limit of 2.5 miles per square mile of open road and 2.5 miles per square mile of motorized trail, on average, in deer winter range or fawning areas to address the potential impacts of motorized routes on deer (USDA FS 1989). Table 3-I.17 shows the average road and trail densities within these deer herd ranges under each Alternative (calculated by dividing the total road or trail mileage on NFS lands in deer ranges by the square miles of NFS lands in deer ranges). The distribution of roads in winter range, rather than a simple average across the entire winter range, may provide a better indication of the effects of motorized routes on deer (deVos et al. 2003).

Critical winter range, critical summer range, and fawning habitats represent key habitats for deer where heavier use and higher quality habitats for wintering and summer use are expected to occur. Focusing upon these more essential portions of winter and summer ranges, Table 3-I.18 shows the proportion of these areas that exceeds the density limit of 2.5 miles per square mile under each alternative, based upon a moving window analysis (see section on "Analysis Factors—Road Density").

Under Alternative A, road densities in winter range would exceed the ENF LRMP limit of 2.5 miles of road per square mile for the Pacific and Grizzly Flat deer herds. Motorized trail densities in winter range would not exceed this limit within any deer herd winter ranges (Table 3-I.17). Seventy percent of the critical winter range habitat for the Pacific deer herd, and 61 percent of the critical winter range habitat for the Grizzly Flat deer herd, would have a density of roads exceeding the ENF LRMP limit of 2.5 miles per square mile in Alternative A. A smaller, but still substantial proportion of the critical winter range habitat for the Blue Canyon and Salt Springs deer herds (39 percent of each) would have road densities exceeding 2.5 miles per square mile (Table 3-I.18). The density of motorized routes is lower within summer ranges and fawning habitats for most deer herds. The ENF LRMP limit of 2.5 miles per square mile of roads or motorized trails, on average, within critical fawning habitats is not exceeded. For the Grizzly Flat deer herd, however, a moderate proportion (44 percent) of available fawning habitat exceeds this limit and the majority of critical summer range (67 percent) exceeds a density of 2.5 miles per square mile of roads (Table 3-I.18).

Average route densities within deer ranges are similar between the action alternatives but, in general, decline between Alternatives B and Modified B, C and D, and E. (Table 3-I.17). Under the action alternatives the average road or trail densities within winter range or fawning habitats do not exceed the ENF LRMP limit of 2.5 miles per square mile. For all deer herds other than the Blue Canyon herd, however, road densities remain above 2.5 miles per square mile over 35 to 50 percent of critical winter range habitat, and 3 to 29 percent of critical fawning habitat, depending upon the herd and the Alternative (Table 3-I.18).

Table 3-I.17: Average road and trail densities (miles/ sq. mile) on NFS lands within deer herd winter ranges and critical fawning areas

Deer Herd Range Type	Alt. A		Alt. B		Mod B		Alt. C		Alt. D		Alt. E	
	Road	Trail	Road	Trail	Road	Trail	Road	Trail	Road	Trail	Road	Trail
Blue Canyon Herd												
Winter	2.0	0.0	1.4	0.0	1.3	0.0	1.3	0.0	1.1	0.0	1.1	0.0
Fawning	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Grizzly Flat Herd												
Winter	3.6	0.7	2.1	0.5	2.3	0.5	2.0	0.6	1.9	0.5	1.8	0.5
Fawning	2.6	0.3	1.8	0.3	1.8	0.3	1.7	0.2	1.4	0.0	1.0	0.0
Pacific Herd												
Winter	3.1	1.0	2.0	1.1	2.0	1.1	1.9	1.0	1.9	1.1	1.8	1.0
Fawning	1.2	0.0	1.0	0.0	0.8	0.0	0.7	0.0	0.7	0.0	0.6	0.0
Salt Springs Herd												
Winter	2.4	0.0	2.0	0.0	2.0	0.0	2.0	0.0	1.9	0.0	1.9	0.0
Fawning	0.7	0.1	0.5	0.0	0.5	0.0	0.4	0.0	0.5	0.0	0.3	0.0

Table 3-I.18: Proportion of critical winter range habitat and proportion of critical fawning habitat above 2.5 miles per square mile of open road or motorized trail

Deer Herd Range Type	Alt. A		Alt. B		Mod B		Alt. C		Alt. D		Alt. E	
	Road	Trail	Road	Trail	Road	Trail	Road	Trail	Road	Trail	Road	Trail
Blue Canyon Herd												
Critical Winter	39	0	25	0	22	0	22	0	13	0	13	0
Fawning	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grizzly Flat Herd												
Critical Winter	61	1	41	1	49	1	41	1	39	1	38	1
Fawning	44	5	29	3	29	0	26	3	15	2	3	0
Pacific Herd												
Critical Winter	70	5	50	7	46	6	44	7	42	6	40	6
Fawning	18	0	10	0	10	0	8	0	9	0	8	0
Salt Springs Herd												
Critical Winter	39	0	35	0	38	0	35	0	35	0	35	0
Fawning	6	0	5	0	4	0	3	0	4	0	3	0

Indicator Measure 2: Does not apply to Mule Deer.

Indicator Measure 3: Critical winter range is considered to provide key habitat for deer during the winter months, and fawning habitat and critical summer range is expected to receive heavier deer use in the summer months. Calculating the proportion of critical winter range and the proportion of critical fawning and summer range occurring within a "zone of influence" associated with roads or trails, provides a measure of the effects of project alternatives upon these key range types. This approach was suggested by Barrett et al. (2004) as a means of quantifying the amount of winter range habitat that may be subject to influence by the designated recreational trails in the Rock Creek Recreation Area.

Based upon the studies cited above, a distance of 800 meters from surfaced roads, and a distance of 200 meters from native surface roads and trails (routes analyzed in this project), was applied to represent the "zone of influence" related to motorized routes. The proportion of each deer herd's critical winter range habitat and critical summer range and fawning habitat occurring within this zone of influence was calculated for each Alternative, as shown in Table 3-I.19. Thresholds associated with this measure have not been established, but relative changes in habitat effectiveness can be evaluated and compared.

Winter Range Habitats: The proportion of critical winter range habitat influenced under Alternative A ranges between 51 and 73 percent; much of this influence is from existing surfaced roads. Routes that would be designated open for use in Alternative A influence 28 to 30 percent of the critical winter range habitat for the Grizzly Flat and Pacific deer herds, and a lesser percentage (1 to 17 percent) for the Salt Springs and Blue Canyon herds (Table 3-I.19). Table 3-I.19 displays a simple system for ranking the degree of influence as "high," "moderate," or "low" as suggested by Gaines et al. 2003. When combined with existing surfaced roads, routes designated in Alternative A influence a high proportion of critical winter range habitat for each of the deer herds (for the Salt Springs herd almost all of this influence results from surfaced roads). Studies indicate varying levels of avoidance within this zone of influence, and the actual degree of impact is likely to be quite variable depending upon site-specific factors such as vegetative cover and the frequency of road use. Nonetheless, considering the area potentially subject to motorized influences, the effectiveness of critical winter range habitat for deer could be reduced.

Alternatives B, Modified B, C, D, and E result in progressively lower proportions of critical winter ranges that are influenced by motorized routes, and existing surfaced routes contribute the majority of this influence (Table 3-I.19). Routes open for use in the action alternatives have the greatest influence upon the Grizzly Flat and Pacific deer herds, influencing between 18 and 21 percent of the critical winter range habitat depending upon the alternative. Alternatives B and Modified B result in a high proportion of critical winter range habitat influenced for the Grizzly Flat and Salt Springs deer herds and moderately influence habitat for the remaining deer herds. Except for the Salt Springs deer herd (for which a high level of influence is associated with existing surfaced roads), Alternatives C, D and E would all result in a moderate level of influence upon critical winter range habitat, using the rating criteria described. Seasonal restrictions under each Alternative (see Indicator Measure 5) influence the actual time during which motorized influences would affect deer on their winter ranges.

Summer Range Habitats: Native surface routes open for motorized use in Alternative A would influence between 13 and 30 percent of critical fawning and summer range habitats for deer herds (Table 3-I.19). As with critical winter range, Alternative A results in a high level of influence upon critical summer/fawning habitat for the Grizzly Flat deer herd. It results in a moderate or low proportion of critical summer range habitat influenced by routes for the Pacific and Salt Springs herds.

Alternatives B and Modified B, C, D, and E progressively reduce the level of road and motorized trail influence upon critical fawning/summer range habitats. The action alternatives reduce route densities to a greater extent in critical summer ranges than in critical winter ranges, and Alternative E results in a substantially lower level of influence upon critical fawning and summer habitats for most herds. Alternative B, Modified B, C, and D continue to result in a high level of road or motorized trail influence on Grizzly Flat herd's critical fawning and summer ranges. For other deer herds, all of the action alternatives result in a moderate or low level of influence within critical summer ranges.

Table 3-I.19: Percent of deer critical winter range and critical summer range/fawning habitats on NFS lands subject to influence by open routes (within 200 m), and relative ranking of the cumulative degree of influence

Deer Herd	Range Type		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Blue Canyon	Critical Winter	%	34	51	48	46	45	43	43
		Rating[a]	Mod	High	Mod	Mod	Mod	Mod	Mod
	Critical Summer/ Fawning	%	N/A	N/A	N/A	N/A	N/A	N/A	N/A
		Rating[a]	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grizzly Flat	Critical Winter	%	35	62	52	53	50	49	46
		Rating[a]	Mod	High	High	High	Mod	Mod	Mod
	Critical Summer/ Fawning	%	32	63	57	57	55	53	44
		Rating[a]	Mod	High	High	High	High	High	Mod
Pacific	Critical Winter	%	28	57	43	44	43	43	40
		Rating[a]	Mod	High	Mod	Mod	Mod	Mod	Mod
	Critical Summer/ Fawning	%	20	33	30	29	27	25	23
		Rating[a]	Low	Mod	Mod	Mod	Mod	Mod	Low
Salt Springs	Critical Winter	%	71	73	72	72	72	72	72
		Rating[a]	High	High	High	High	High	High	High
	Critical Summer/ Fawning	%	9	22	19	20	18	20	12
		Rating[a]	Low	Low	Low	Low	Low	Low	Low

[a]High level of influence = >50% of key habitat within zone of influence, Moderate level of influence = 25% – 50% of key habitat within zone of influence; Low level of influence = <25% of key habitat within zone of influence (Gaines et al. 2003)

CW = Critical Winter Range

CS/F = Critical Summer and Fawning Ranges

Indicator Measure 4: Table 3-I.20 (riparian habitat and species group section) shows the percentage of meadow habitat polygons with motorized routes under each alternative. Routes open for use in Alternative A would include native surface routes within 163 meadows, potentially limiting or displacing deer use within these meadows. When combined with surfaced roads already designated for public use, 197 meadow areas (16 percent of the meadow habitat within the ENF boundary) are affected by routes.

Alternatives B, D, C, and Modified B affect progressively fewer meadow areas than Alternative A, resulting in 7 to 12 percent of available meadow habitat containing routes when existing surfaced roads are included (Table 3-I.20). Alternative E is the only alternative that does not open motorized routes within meadows, and thus provides the greatest benefits to deer in optimizing the availability and suitability of these important fawning and summer foraging habitats.

Indicator Measure 5: The wet weather closures that would be applied under the action alternatives would substantially reduce effects of these alternatives upon wintering deer as compared to Alternative A, which has no seasonal closure. Under Alternatives B, Modified B, and E, native surface routes open for use within winter ranges would be closed a minimum of three out of the six to seven months that deer are typically on their winter ranges. Native surface routes would be closed a minimum of five of the six to seven months in Alternative D and a minimum of six months in Alternative C. All of these alternatives could have longer wet weather closure periods but this would remain uncertain because it would depend upon rainfall and soil conditions. Given the approach to seasonal closures, Alternative C would have the least effect upon wintering deer, since routes open for use would be closed for a full six months, coinciding almost entirely with the period that deer are on their winter ranges. Of the remaining action alternatives, B and Modified B would have the greatest effect on wintering deer and D and E would have intermediate effects due to the lower route density in E and the longer winter closure season in D.

Indicator Measure 6: Alternative B would designate 12 unauthorized routes that affect meadows, Alternative D would designate 3, and Alternatives C, E and Modified B would not open any new routes within meadow habitat (Table 3-I.30, at end of Section).

Cumulative Effects – Mule Deer

Impacts associated with all alternatives increase when all lands within the Forest boundary (private lands and the Rock Creek Recreational Trails area) are considered. Within this area, the proportion of critical winter range habitat influenced by motorized routes increases by about 5 to 25 percent, and critical summer range/fawning habitat by about 2 to 5 percent for most deer herds. These lands contribute to substantially higher effects within the Pacific deer herd’s critical winter range, which includes the Rock Creek Recreational Trails area.

Appendix E provides a list and description of past, present, and reasonably foreseeable projects on the ENF and private lands within the Forest boundary. Some, but not all, of these activities will contribute to effects upon deer. (CDFG 1998) identified the following primary factors influencing deer populations in the Central Sierra Nevada: (1) reduced forage availability resulting from fire exclusion; (2) reduced forage and cover resulting from logging, forest thinning, and/or herbicide treatments; (3) reduced forage and cover resulting from livestock grazing in meadows; and (4) loss of habitat to private land development. These, along with predation and hunting, correspond to factors that were identified as potentially affecting the Pacific deer herd (Barrett et al. 2004).

Within the project area, hazardous fuels reduction and associated timber harvest have occurred on approximately 57,500 acres of NFS land over the past decade (Appendix E). Approximately 31,900 acres were thinned, masticated, or prescribe burned between 2001 and 2006. These treatments are anticipated to be the primary activity that will alter forest vegetation within deer ranges over the next several years, during which time about 20,000 acres of hazardous fuels reduction treatments are anticipated to occur (Appendix E).

Poor forage condition has been documented for the Pacific deer herd (USDA FS 2006) and is largely attributed to fire suppression and changing forest management practices on public and private land (forest thinning treatments, rather than clearcutting and group selection timber harvest) (CDFG 1982, CDFG 1998). Thinning and mastication can benefit deer by removing dense overstory vegetation thereby encouraging the growth of young brush, grasses, and forbs in the understory, which is preferred by deer for forage. Thinning of conifers also releases the remaining oaks and encourages new oak sprouts. The benefit of thinning on deer habitat has been questioned, however, due to concern that the treatments remove hiding and thermal cover over large acreages and may result in a decline in forage in the short term (Kucera and Barrett 1995 In CDFG 1998, Barrett et al. 2004). Although these treatments will reduce deer hiding cover and may reduce forage for several years, forage values are expected to improve in the long-term, especially where followed by additional prescribed burning treatments. Analysis of cover to forage ratios within deer herd ranges on the ENF indicates that forage is generally a more limited resource than cover (see Eldorado National Forest MIS Report).

Fire suppression has also resulted in decreasing forage availability for deer. The approximately 20,000 acres of NFS land that have burned in wildfires since 2001, have increased forage availability across the broad landscape, but the intensity and large size of the fires did not result in optimum distribution of openings and cover. Within the project area, prescribed burning has occurred on about 5,200 acres between 2001 and 2006. Prescribed burning can help offset the negative effects of fire suppression and is widely accepted as a valuable tool to enhance deer habitat (CDFG 1998). Burning enhances many plants favored by deer for forage by stimulating new growth on sprouting species, germinating seeds in fire-adapted species, thinning understory vegetation to allow more light to the forest floor, and consuming part of the duff layer to enhance the seedbed.

Between 28 and 36 percent of deer herd ranges on the ENF occur on private lands within the Forest boundary, the majority of which are managed for timber production. CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted. On private timberlands, harvest methods include selective thinning and regeneration (clearcut) and then are reforested using herbicides to suppress competing vegetation. Clearcut harvest can benefit deer by promoting early succession vegetation that deer prefer, but the benefit to foraging habitat is limited in quality, quantity, and duration by reforestation efforts (CDFG 1998, deVos et al. 2003). Early succession habitat is available to deer for 8 to 12 years under these conditions as opposed to up to 30 years under natural regeneration (deVos et al. 2003).

Detailed analysis completed for the Rock Creek Recreation Trails Supplemental EIS showed that, on NFS lands, about 13 percent of the Pacific deer herd's critical winter range, 11 percent of the winter range, 9 percent of the intermediate range (including holding and migration corridors), and 5 percent of the summer range (including critical summer and fawning), had been treated within the past decade or is planned to be treated in the next five years through thinning, mastication, and/or prescribed burning. Another 11 percent within the range of the Pacific Deer Herd has been or will be treated on Sierra Pacific Industries land (USDA FS 2006).

Currently, none of the Pacific deer herd's summer range or fawning areas are affected by livestock grazing; however, the majority of summer range and fawning areas for the Grizzly Flat and Salt Springs deer herds do occur within active grazing allotments. Livestock grazing, particularly within meadows, has reduced the quality of fawning and foraging habitats for deer. Monitoring of the condition and trend of Sierra montane meadows indicates that meadow condition across the bioregion shows a slight upward trend (Green 2003). Meadow condition on the ENF is expected to continue to improve based upon management changes that are being implemented in new Allotment Management Plans for grazing allotments. Allotment

Management Plans have been recently completed or are expected to be completed this year on the Pardoe, Sherman, and Cody Meadow grazing allotments, which cover the majority of summer range for the Grizzly Flat and Salt Springs deer herds.

Although mule deer populations “ultimately are limited by habitat quality and quantity,” other stressors can exacerbate decline, particularly in poor habitat conditions (deVos et al. 2003, Barrett et al. 2004). At present, livestock grazing influences the quality of meadow habitat used by two deer herds, and fuels treatments may be reducing cover or forage in localized areas (though forage may be improving in areas treated more than five to ten years ago). Existing surfaced roads influence a considerable portion of deer critical winter ranges and critical summer ranges (around 30 percent of critical winter range for most herds, but as high as 70 percent for the Salt Springs deer herd), and also result in increased mortality from collisions. Other types of recreation, including hiking and equestrian use along 375 miles maintained as non-motorized trails, result in disturbance and displacement effects that may be similar to those described for the motorized routes in the project Alternatives. The combined effects of forest uses and management actions upon deer and their habitat is complex (deVos et al. 2003).

As described in the project MIS Report, herd composition counts indicate that the deer population within the Central Sierra Nevada is increasing (CDFG 2003). The amount of high quality cover and forage habitats on the Forest are estimated to have increased between 1991 and 1997 based upon the Forest’s vegetation inventories (Eldorado National Forest MIS report). Nonetheless, deer herds on the ENF remain below the population goals established by the California Department of Fish and Game in Deer Herd Management Plans. A committee of four wildlife scientists tasked with evaluating the likely influence of recreation use upon deer using the Rock Creek Recreational Trails Area, concluded that sufficient information was lacking to make informed statements about the likely effects of sustained or increased recreational use other than the effects are not likely to be positive. The committee concluded that increasing recreation use on the winter range in the Rock Creek Recreation Area may hinder efforts to reach population goals established for the Pacific deer herd.

Because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is a high degree of uncertainty about future route proliferation and associated cumulative impacts upon deer. Alternatives B and Modified B, D, C and E result in progressively lower influence upon deer habitats. For the Grizzly Flat deer herd, Alternatives B and Modified B continue to result in greater than 50 percent of critical winter range and critical summer range habitat being subject to the influence of motorized routes, though Modified B reduces the effects of motorized routes in meadow habitats, as compared to Alternatives B, C, and D. The MIS report prepared for this project indicates that Project alternatives may affect the quality of mule deer habitat, but alternatives will not influence measured trends in the amount of Forest-wide deer habitat (project MIS report).

Summary of the Effects to the Ungulates Group

Where disturbance from motorized road or trail use causes deer to avoid areas within preferred habitats, animals may be forced into less preferred or lower quality habitats. Such shifts, particularly if repeated, can result in adverse impacts to the energy balance of individual deer and ultimately can decrease population productivity, especially on winter ranges (deVos et al. 2003). Variables such as the amount and frequency of traffic, and the spatial distribution of roads in relation to deer use, influence the degree of negative effects that roads have on deer use in forested habitats (Perry and Overly 1977, Johnson et al. 2000, deVos et al. 2003).

Road densities in Alternative A exceed 2.5 miles per square mile and do not meet ENF LRMP Standard and Guideline limits for road densities for the Pacific and Grizzly Flat deer winter ranges. Summer range and fawning habitats are also substantially influenced by roads in this alternative. A substantial portion (greater than 50%) of deer critical winter range and critical summer range/fawning habitats are subject to the influence of motorized routes in Alternative A. The density of routes in critical winter ranges, critical fawning habitats, and meadows in Alternative A, may adversely affect deer populations and contribute to other factors that are hindering achievement of deer herd population goals.

Alternatives B, Modified B, C, D and E each comply with ENF LRMP Standards and Guideline limits for road and trail densities. These alternatives are progressively less likely to result in adverse effects since route densities in important deer habitats are lower. Nonetheless, a substantial portion (greater than 50%) of Grizzly Flat deer herd's critical winter range and critical summer range/fawning habitats are subject to the influence of motorized routes in Alternatives B and Modified B. Alternative E is least likely to hinder reaching herd population goals since it has the lowest route densities and does not designate motorized routes within meadow habitats which often serve as key fawning areas and population centers during the summer months (CDFG 1998).

Riparian Habitat and Species Group

Riparian habitats occur in narrow, linear configurations that are often traversed by roads and trails. These habitats are used by wildlife disproportionate to their availability (Gaines et al. 2003, SNEP 1996). Wildlife species associated with riparian habitats are particularly vulnerable to the effects of recreation activities on their habitat because of the concentration of these activities in riparian areas. Management direction in the ENF LRMP establishes "Riparian Conservation Areas (RCAs)" to be managed for the purpose of maintaining or developing healthy riparian and aquatic habitat.

Montane meadows provide particularly important riparian habitat for Sierra Nevada wildlife; not only is there a substantial subset of species that are dependent upon meadow habitats, the population densities of many forest-inhabiting species are often highest on the edges of meadows or in habitat with meadow inclusions (Graber 1996). Roads and trails within meadows can intercept surface and subsurface hydrological flow (Kattlelmann and Embury 1996). When flows are intercepted and redirected, meadow drying occurs, reducing standing water and the cover of herbaceous vegetation that is important for many wildlife species. In addition to these effects, the likelihood of illegal off-route motorized use occurring and damaging meadow vegetation and hydrology increases as greater numbers of meadows are accessed by open routes. Such use can have profound effects upon the suitability of meadow habitats by increasing bare soil, and creating ruts and gullies. Table 3-I.20 shows the number of meadow sites with motorized routes under each Alternative.

Alternative A opens routes that occur within 163 meadow areas (GIS polygons). When existing surfaced roads are included, 16 percent of the meadows within the ENF contain motorized routes under Alternative A. Alternatives B, D, C or Modified B, and E affect progressively fewer meadow areas. Alternative E is the only Alternative that does not open routes within meadows, and will, therefore, have little effect upon this important habitat (the single meadow shown as affected in Alternative E exists in the meadow inventory but field verification indicates does not have meadow characteristics). The routes occurring in meadows in Alternatives B, D, C and Modified B vary in their effect upon meadow hydrology and vegetation. Some routes occur barely within the meadow's edge whereas other routes cross drainages and are likely to alter meadow hydrology and function.

Of the routes designated within meadows, 12 are unauthorized (new) routes in Alternative B and 9 are unauthorized routes in Alternative D. Alternatives C, E and Modified B do not designate any unauthorized routes within meadows (Table 3-I.30).

Table 3-I.20: Number and percentage of meadow polygons with a motorized route

Measure	Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Number of meadows with routes (NFS only)	34	197	138	74	114	120	34
Percentage of meadows (all lands)*	3	16	12	7	11	11	3

*Includes habitat on all lands occurring within the National Forest boundary.

Riparian Birds

The Swainson's thrush, warbling vireo, tree swallows, and black-headed grosbeak are focal bird species associated with riparian habitats in the Sierra Nevada (RHJV 2004). Additional focal species are associated with meadow habitats and will be addressed with the willow flycatcher, which, along with mule deer and black bear, serves as a MIS for meadow habitats. Riparian bird species are likely to be affected by the following road and motorized trail-associated factors: displacement or avoidance, habitat loss or fragmentation, reduction of snags, and routes for competitors.

Displacement or Avoidance: Van der Zande et al. (1984 and 1980) found that the density of woodland bird species declined as recreation intensity increased, and that increases in traffic intensity had a larger disturbance effect upon birds where traffic intensity is lower than where traffic intensity is high. Gutzwiller et al. (1994) found that in some bird species, singing activity declined in response to human intrusion. Because male singing is essential to mate selection and territory defense in song birds, levels of intrusion that alter normal singing patterns have the potential to lower the reproductive fitness of birds sensitive to disturbance. The human desire to be close to streams and lakes results in a higher concentration of recreation use in riparian areas, particularly when these areas are accessed by motorized routes.

Habitat Loss and Fragmentation, Edge Effects, Snag Reduction: Stream crossings remove a segment of riparian vegetation and fragment riparian corridors. The desire of people to be close to streams and lakes has resulted in the location of routes in riparian habitats, and in some instances, substantial loss of riparian vegetation in streamside zones (SNEP 1996). Greater foot traffic and dispersed campsites associated with motorized access can result in loss and fragmentation of riparian vegetation, and the removal of hazard trees can reduce snag and down log availability within this corridor. These effects, in turn, reduce habitat quality for birds that are associated with riparian habitats.

Route for Predators: Western riparian habitats are naturally linear systems with extensive edges. Patch isolation (lack of connectivity) may influence these bird communities as much as habitat fragmentation (RHJV 2004). Small patch size and/or patch isolation may increase predation and brood parasitism rates and limit population dispersal (RHJV 2004). Roads and trails that bisect forested habitats (including riparian habitats) create habitat edges which may facilitate nest parasitism. Miller et al. (1998) found that in forest ecosystems, bird species composition was altered adjacent to trails and that nest survival increased as distance from trails increased. Paton (1994) reviewed studies on the influence of edge habitat on nest predation and found that the majority of studies showed elevated levels of predation near habitat edges.

Direct and Indirect Effects for All Alternatives – Riparian Birds

Indicator Measure 1: Does not apply to riparian birds.

Indicator Measure 2**:** Open routes will provide human access to a number of dispersed recreation sites across the Forest. Because dispersed recreation sites most often occur near water, riparian habitats are subject to a disproportionately high magnitude of effect associated with human disturbance.

Unsurfaced routes that would be open in Alternative A provide motorized access to within 300 feet of 503 known dispersed recreation sites. Alternatives B, C, D, Modified B, and E access progressively fewer dispersed recreation sites thereby incrementally reducing the degree of influence associated with human intrusion (Table 3-I.4). Alternative B accesses 20 percent fewer dispersed sites than Alternative A; Alternative C, 27 percent fewer, Alternative D, 32 percent fewer; Modified B 39 percent fewer and Alternative E, 50 percent fewer dispersed sites than Alternative A.

Indicator Measure 3: To evaluate potential influence of road or trail-associated habitat loss and fragmentation, edge effects, and routes for predators upon riparian bird species, the proportion of RCA area occurring within 60 meters of routes within each 5^{th} field watershed was analyzed (Table 3-I.21). Thresholds associated with this measure have not been established, but relative changes in habitat effectiveness can be evaluated and compared.

Alternative A, results in nine 5^{th} field watersheds that have more than 10 percent of habitat in RCAs occurring within 60 meters of motorized routes. Three watersheds (the South Fork American River-Alder Creek, Upper Consumnes, and North Fork Cosumnes watersheds) have more than 25 percent of habitat in the RCA within this zone of influence. Fragmentation of these important streamside habitats is likely to reduce the quality of habitat for songbirds. Some riparian bird species, such as the Swainson’s thrush, have experienced serious population declines in the Sierra Nevada. Reduced habitat quality and the potential for higher rates of predation within riparian habitat associated with roads and trails, may affect populations.

In most 5^{th} field watersheds the habitat influence of routes within RCAs is reduced progressively between Alternative A, B or Modified B, C, D and E. For most watersheds the area in RCAs influenced by motorized routes declines by 50 percent or more between Alternative A and Alternative E, and by a lesser extent in the other Alternatives. The RCAs in the SF American River-Alder, the Upper Cosumnes and the North Fork Cosumnes watersheds continue to have more than 10 percent of the RCA area within within 60 meters of a route even in Alternative E.

Table 3-I.21: Percent of RCA on NFS lands occurring within 60 meters of a motorized route

Fifth Field Watershed	Percent of RCA						
	Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Upper MF American River	2	11	6	6	5	3	3
Lower MF American River	< 1	8	4	4	3	3	3
SF American River-Alder Creek	6	34	17	17	18	12	12
SF American River-Chile Bar	2	10	5	6	5	5	4
NF Cosumnes River	5	29	18	19	18	17	15
Upper Cosumnes River	5	33	27	28	27	25	22
Lower NF Mokelumne	5	14	12	13	11	11	9
Webber Creek	NA	NA	NA	NA	NA	NA	NA
SF American River-Lake Aloha	4	12	8	8	8	7	5
Upper NF Mokelumne	1	4	3	3	3	3	2
Rubicon River	3	10	7	7	6	6	5
Silver Creek	3	14	10	10	10	9	7
Silver Fork American River	4	16	11	11	10	8	6

Indicator Measures 4-5: Do not apply to riparian birds.

Indicator Measure 6: Alternative B designates 17.2 miles of unauthorized routes within RCAs, Alternative D designates 12.3 miles of unauthorized routes in RCAs, 5.5 miles in Alternative C, 4.9 miles in Modified B and 3.6 miles in Alternative E. The list of these routes is available in the project file. In Alternative E and Modified B unauthorized routes within the RCA of perennial streams have been designated only where it is evident that riparian conservation objectives are being met (see aquatic wildife section).

Cumulative Effects – Riparian Birds

Within most 5th field watersheds, the proportion of RCA influenced by motorized routes increases 2 to 5 percent when effects on private lands and within the Rock Creek area are included. The Sierra Nevada Ecosystem Project found that, overall, the basic functions of riparian systems, such as providing habitat for avian and terrestrial wildlife, “still remain in most places although often in impaired form (Kattlemann and Embury 1996).” Habitat loss and degradation are probably the most important factors causing the decline of riparian bird populations (RHJV 2004). In addition to motorized routes, the primary activities that have influenced riparian habitat conditions on the ENF include dams and hydropower management, campgrounds and dispersed camping, logging and hazardous fuels reduction treatments, wildfires, and livestock grazing.

Past logging and more recent fuels reduction projects have affected riparian habitats, primarily through the creation of roads and their effects on hydrology and watershed conditions (see aquatic species section). Hazardous fuels reduction treatments do not generally occur in riparian habitats, however, temporary road construction and road reconstruction that occurs for these projects may result in road crossings or road influences affecting riparian vegetation; they may also allow for improvements of crossings and overall improvement to riparian conditions. The Affected Environment sections for hydrology and aquatic resources provide information on the existing conditions of riparian areas, which have resulted, in part, from past and current logging and vegetation management activities, as well as the restoration efforts associated with these activities. About 20,000 acres of hazardous fuels reduction treatments are planned over the next several years based upon projects listed in Appendix E. Additional cumulative effects to riparian habitat result from harvest on private lands, where CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted.

Recreation developments, dispersed camping, and other human recreation activities, which often occur near water, have resulted in losses in riparian vegetation and fragmentation of riparian corridors. These effects have not been quantified; however, an aerial survey completed for the Sierra Nevada Ecosystem Project indicated that extensive loss and fragmentation of riparian vegetation was common along most Sierra riparian corridors, especially at lower elevations (Kattelmann and Embury 1996). Riparian areas lacking vegetation cover were found to be usually associated with vehicular access, and roads were found to have substantially affected riparian areas throughout the Sierra Nevada. Among the 24 river basins studied in the Sierra Nevada, the Cosumnes and Mokelumne River Basins were found to be most influenced by roads, based upon the proportion of these Basins with roads within 100 meters of the stream (Kattelmann and Embury1996). Forseeable future actions listed in Appendix E do not indicate additional effects from future recreation developments.

The Sierra Nevada Ecosystem project concluded that streamside and meadow vegetation has remarkable ability to recover from disturbance, but that human disturbances (such as roads) need to be removed or reduced to give the natural recovery process in these areas a chance (Kattalmann and Embury 1996). Alternative A will not reduce human disturbance within RCAs. Combined with the effects of hazardous fuels treatments and current recreation uses, Alternative A is most likely to result in adverse cumulative effects to riparian habitat and associated species, particularly in the Upper Consumnes, North Fork Cosumnes, and South Fork American River-Alder Creek watersheds. In these watersheds nearly 30 percent or more of the Riparian Conservation Area is within 60 meters of open routes and because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is a high degree of uncertainty about the additional area that may be affected by future route proliferation. Since much of the route proliferation occurs in relation to dispersed camping near water, riparian species may be disproportionately affected by future route proliferation in Alternative A. Substantial reduction of routes in the RCAs does occur in the Action Alternatives, most notably under Alternative E. Alternative E will provide the greatest opportunity for natural recovery processes within riparian habitats, followed by Alternative D, C and Modified B or B.

Willow Flycatcher and Other Meadow-Associated Birds

At present, willow flycatchers are not known to breed at any sites on the ENF, but they are an MIS representing the effects of management actions within meadow habitats. Additional riparian focal species that use meadow habitats include the song sparrow, yellow warbler, and Wilson’s warbler (RHJV 2004). Meadows also provide important habitat for the red-breasted sapsucker, which is identified as a “Watch List” species in the Partners in Flight North American Landbird Conservation Plan. Meadow habitat may be affected by the following road or motorized trail-associated factors: habitat loss or fragmentation, edge effects, and routes for competitors.

Habitat Loss and Fragmentation, Edge Effects, and Routes for Competitors: Roads and trails within meadows intercept surface and subsurface hydrological flow (Kattlelmann and Embury 1996, Tromulak and Frissell 2000). When flows are intercepted and redirected, meadow drying occurs, reducing standing water and the cover of herbaceous vegetation that is important for insect populations and willow flycatcher foraging (Green et al. 2003). As meadow stream channels become incised, the surrounding water table is lowered and flood events capable of inundating the surrounding meadow become increasingly rare. Substantial changes in vegetation, including loss of woody riparian vegetation (i.e. willows and alders), forest encroachment, and changes in graminoid community composition can then result (RHJV 2004). The access that motorized routes provide into meadows can also increase recreational activities and associated habitat disturbance, but much of the impact to meadow vegetation on the ENF has been the result of off-route motorized use within meadows. Illegal off-route use within the meadows accessed by motorized routes can substantially increase impacts beyond those created by the route itself. Off-route use has the potential to remove vegetation and disturb soil within large portions of meadows profoundly affecting the suitability of meadow habitats for wildlife.

Direct and Indirect Effects for All Alternatives – Willow Flycatcher and Other Meadow-Associated Birds

Indicator Measures 1-2: Do not apply to Willow Flycatcher and meadow associated birds.

Indicator Measure 3: Meadows that are larger than 10 acres in size hold standing water through June, and have a willow shrub component provide preferred habitat for willow flycatchers on the ENF (see Biological Evaluation for a more detailed description). To evaluate the effects of motorized routes on willow flycatcher habitat, the proportion of potential willow flycatcher meadow sites containing motorized routes is evaluated (Table 3-I.22). The proportion of all meadow sites affected by routes is evaluated in Table 3-I.20.

In Alternative A, unsurfaced routes remain open within 163 meadow polygons; 21 of these meadows are mapped as providing potential willow flycatcher habitat. This, combined with existing surfaced roads, results in Alternative A influencing 21 percent of the willow flycatcher habitat mapped on NFS lands (Table 3-I.22). The specific influence of these routes has not been evaluated, but their presence increases the likelihood for detrimental impacts to meadow hydrology and vegetation, both from the route itself and from damage caused by off-route use.

Alternative B has unsurfaced routes open for use in 104 meadows, 12 of which provide preferred willow flycatcher habitat and Alternative D has open routes in 86 meadows, 11 of which provide preferred willow flycatcher habitat. Alternatives C has routes in 80 meadows, 11 of which provide preferred willow flycatcher habitat, and Modified B affects 40 meadows, 10 of which provide preferred willow flycatcher habitat. These alternatives result in effects to between 8 and 13 percent of meadows providing preferred habitat for willow flycatchers (Table 3-I.22). Alternative E would have no effect upon willow flycatcher habitat or habitat for other meadow-associated species since this alternative does not have open routes in meadows. Routes already designated for public motor vehicle use (surfaced roads) would affect three meadow sites, however.

Table 3-I.22: Number of meadows providing willow flycatcher habitat with a motorized route

Analysis Area	Number of Meadows	Number of WIFL Meadow Sites with Routes						
		Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
NFS Lands	116	3	24	15	13	9	14	3
All Lands*	158	6	40	31	28	25	30	18

*Includes habitat on all lands occurring within the National Forest boundary.

Indicator Measure 4: Indian Valley provides the only willow flycatcher habitat that has been recently occupied on the ENF. Past downcutting of the stream and drying in the meadow has reduced the amount of wet area providing willow cover and habitat for willow flycatchers. Alternatives A would designate routes 19E04 and NST1904A,B, and C which occur within the meadow and cross the stream in several locations. NST 1904C, occurs adjacent to occupied willow flycatcher habitat. Motorized use on and off these routes has contributed to vegetation loss and hydrologic impacts in the past, particularly at stream crossings. Restoration efforts have attempted to limit off-route use and improve stream conditions. The potential for route proliferation and off-route use in Alternative A, which does not prohibit cross country travel, increased the risk of degradation and loss of occupied willow flycatcher habitat under Alternative A. Alternative D would designate 19E04, which bisects the meadow for about 1.5 miles. Alternative D, would prohibit cross-country travel, and active restoration efforts (such as are currently being planned) could reduce habitat impacts from this route. The potential impacts to habitat from the existing route or from illegal use off the route, would be greater than under Alternatives B, Modified B, C and E, which do not designate this route within Indian Valley.

Indicator Measure 5: Does not apply to willow flycatcher and meadow-associated birds.

Indicator Measure 6: The majority of routes occurring within meadows in the Action Alternatives are existing system roads or trails. In Alternative B, however, 12 unauthorized routes that occur in meadows would be designated and in Alternative D, nine unauthorized routes in meadows would be designated. Alternatives C, E and Modified B do not designate new or unauthorized routes in meadows (Table 3-I.30).

Cumulative Effects – Willow Flycatcher and Other Meadow-Associated Birds

The percentage of willow flycatcher meadow sites influenced by motorized routes increases by about 6 to 8 percent when the analysis area includes private lands within the Forest boundary (Table 3-I.22). The Forest Service has completed a Conservation Assessment of the Willow Flycatcher in the Sierra Nevada (Green et al. 2003), which identified meadow drying, loss of nesting and foraging substrates (riparian shrubs), increased predator access to meadow interiors, and potential cowbird parasitism as among the key factors likely responsible for the decline of the willow flycatcher. Livestock management, recreation, water developments, and roads are described as causative factors.

Historic livestock grazing has severely impacted some meadows and is considered to be a primary factor that has influenced the suitability of willow flycatcher habitat and meadow habitat for birds in general (Graber 1996, Green et al. 2003, Menke et al. 1996). Livestock grazing on montane meadows decreases the height and density of herbaceous growth. Many of the landbird species utilizing these meadows feed upon insects that decline in response to removal of this herbaceous growth (Graber 1996). Poorly managed grazing in riparian areas can reduce nesting densities of many bird species, and particularly of habitat specialists such as the willow flycatcher, Lincoln’s sparrow, and White-crowned sparrow (RHJV 2004). Livestock grazing on active allotments currently affects 29 percent of willow flycatcher meadow habitat on the Forest. The condition of these meadows varies, but the majority of this meadow habitat occurs within allotments that have completed, or are in the process of completing, new Allotment Management Plans designed to alter livestock use to meet stricter ENF LRMP Standards and Guidelines for meadow protection (Appendix E).

Non-motorized trails allow for backcountry hiking and camping, which occurs in meadows not accessed by motorized routes, and can adversely affect additional meadow habitat or disturb species. These activities are generally dispersed and of low impact to habitat, particularly in sites most suitable for willow flycatcher, which are typically very wet. Foreseeable future action listed in Appendix E do not indicate additional effects from future projects.

Factors responsible for the decline of willow flycatcher populations in the Sierra Nevada are thought to be largely an agent or result of habitat change, particularly the alteration of meadow hydrology (Green et al. 2003). The direct and indirect effects of motorized routes within meadows in Alternative A, B, Modified B, C and D can adversely affect willow flycatcher habitat as well as habitat for other meadow associated birds, and, combined with the effects of past livestock grazing contribute to cumulative impacts. These risks are greatest in Alternative A, where cumulatively 25 percent of willow flycatcher habitat is affected by open routes, and where occupied habitat may be affected by motorized use (particularly cross-country travel) in Indian Valley. These risks decrease incrementally under Alternatives D, B, C, and Modified B which affect progressively fewer meadow sites, and which, except Alternative D, do not designate routes in occupied habitat. Alternative E does not contribute to cumulative effects upon willow flycatcher habitats or meadow habitat in general.

The Management Indicator Species (MIS) Report prepared for this project describes a stable or upward trend in the quality of willow flycatcher habitat in the Sierra Nevada and on the ENF, but a significant decline in the Sierra Nevada willow flycatcher population since 1997. As described in the MIS report, except for Alternative E, project alternatives may contribute to declines in habitat quality. Given the willow flycatcher's precarious population status, cumulative effects to meadow habitats and to occupied habitat in particular in Alternative A, may result in a trend toward Federal listing for the willow flycatcher. Because cross-country travel is prohibited under the Action Alternatives, the magnitude of cumulative effects is considerably less and is not likely to result in a trend toward Federal listing or a loss of viability for the willow flycatcher (see project Biological Evaluation).

Great Gray Owl

At present, Great gray owls are not known to breed at any sites on the ENF, but the Forest provides potential habitat for this sensitive species. Great gray owls utilize large meadows for foraging and require large diameter trees surrounding meadows for nesting. Motorized route-associated factors likely to influence Great gray owls on the ENF are predominantly associated with changes to habitats, since nest sites are not known to occur on the Forest. Use and occupancy of habitat by great gray owls may be affected by route associated impacts to the quality of meadow habitat, as described for the willow flycatcher.

Direct and Indirect Effects for All Alternatives – Great Gray Owl

The effects are the same as those described for the willow flycatcher.

Cumulative Effects – Great Gray Owl

Factors responsible for low numbers of Great gray owls breeding in the Sierra Nevada are not fully known. During the past century, the widespread removal of large trees from mature and old-growth forest has reduced the abundance of potential nest trees, fire suppression has allowed meadow foraging habitats to decrease in size, and livestock grazing altered meadow hydrology, potentially reducing prey abundance (Verner 1994).

The direct and indirect effects of motorized routes within meadows in Alternatives A, B, Modified B, C, and D, combined with the effects of past and continued livestock grazing, may adversely affect meadow habitats and associated species (as described for the willow flycatcher). Cumulative effects to habitat are not likely to result in a trend toward Federal listing or a loss of viability for the Great gray owl since considerable unoccupied habitat remains unaffected by motorized routes in each of the Alternatives, and since nesting is not currently known to be occurring on the Forest (see project Biological Evaluation).

Bald Eagle

Nine reservoirs on the ENF provide potential nesting habitat for bald eagles, and four of these reservoirs currently support a nesting pair of bald eagles. Bald eagles could be affected by the following road and motorized trail-associated factors: displacement and avoidance, disturbance at a specific site (nest site), and reduction of snags.

Displacement and Avoidance and Disturbance at a Specific Site (nest sites): Reported responses of bald eagles to human activities have included spatial avoidance of activity and reproductive failure (Anthony et al 1995). Bald eagles seem to be more sensitive to humans afoot than to vehicular traffic (Grubb and King 1991, Hamann 1999). Anthony and Isaacs (1989) found that the mean productivity of bald eagle nests was negatively correlated with their proximity to main logging roads, and the most recently used nests were located in areas farther from all types of roads and recreational facilities when compared to older nests in the same territory. Grubb and King (1991) evaluated the influence of vehicle traffic on bald eagle nesting activities and recommended buffers of 450 meters for vehicles. The U.S. Fish and Wildlife Service, in its 2007 Bald Eable Management Guidelines, recommended a 100 to 200-m nest site buffer for off-road vehicle use. Nest site protection through area closures is one of the primary ways that the Forest Service and land management entities have implemented measures to avoid the potential for nest failures due to human disturbances.

Direct and Indirect Effects for All Alternatives – Bald Eagle

Indicator Measures 1 and 2: Do not apply to the Bald Eagle.

Indicator Measure 3: The proportion of bald eagle nesting habitat occurring within 400 meters of a motorized route is analyzed to evaluate the potential influence of roads or motorized trails upon displacement or avoidance effects within nesting habitat (Table 3-I.23

The larger lakes and reservoirs on the ENF are all accessed by surfaced roads and have a number of developed campsites supporting relatively high levels of recreation use. Numerous unauthorized routes have developed in many of these areas over time. Alternative A would directly influence an average of 26 percent of the bald eagle nesting habitat around these reservoirs, and as much as 51 percent of the bald eagle nesting habitat around Union Valley and Ice House Reservoirs. Combined with existing surfaced roads, up to 95 percent of habitat is subject to the influence of roads.

Routes open for use in Alternatives B, Modified B, C, D and E, have lesser and varying levels of influence upon bald eagle nesting habitat, depending upon the Reservoir site (Table 3-I.23). Existing surfaced roads represent a high percentage of the effect, except around Union Valley, Salt Springs, and Bear River Reservoir, where unsurfaced routes open for use under the alternatives contribute a large proportion of the road or trail influence. Overall, of the action alternatives, Alternative E affects the lowest proportion of bald eagle habitat and Alternative B or Modified B, the greatest.

Table 3-I.23: Percent of bald eagle nesting habitat on NFS lands occurring within 400 meters of a motorized route

Reservoir	Percent of Bald Eagle Nesting Habitat						
	Surfaced Roads	Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Bear River Reservoir	43	80	74	77	72	74	72
Hell Hole Reservoir	21	42	38	38	27	30	30
Jenkinson Lake	39	50	39	39	39	39	39
Loon Lake	33	41	38	39	37	37	37
Salt Springs Reservoir	11	60	50	52	50	44	44
Silver Lake	31	54	52	51	36	51	32
Stumpy Meadows Reservoir	69	79	69	69	69	69	69
Union Valley and Ice House Reservoirs	44	95	75	67	74	74	74

Indicator Measure 4: Bald eagles have nested at Jenkinson Reservoir, Loon Lake, Union Valley Reservoir, and Stumpy Meadows (on private land). The number of routes open for public wheeled motor vehicle use within 450 meters of bald eagle nest sites is analyzed to evaluate the potential influence of road or trail-associated disturbance and displacement and avoidance effects upon bald eagles.

Alternative A is the only alternative with open routes within 450 meters of a bald eagle nest location. Under Alternative A, two unauthorized routes occurring within 200 meters distance from a bald eagle nest site at Union Valley Reservoir would remain open for public use. This could result in nest site disturbance, unless specific closure orders were issued to prevent use on these routes during the breeding season.

Alternatives B, Modified B, C, D, and E do not have open routes within 450 meters of bald eagle nest sites.

Indicator Measure 5: Vehicle noise from over the snow travel could disturb reproductive behavior during the early portion of the bald eagle nesting season. Under any of the alternatives this effect is probably minor since limited accessibility restricts use to relatively few locations on the forest.

Indicator Measure 6: The Action Alternatives do not propose to designate any unauthorized routes occurring within 450 meters of bald eagle nest sites.

Cumulative Effects – Bald Eagle

Bald eagle populations are estimated to be increasing range-wide, statewide, and on the ENF (USDA FS 2007). The primary risks to the bald eagles have been identified as: (1) ingestion of poisonous substances; (2) collision with stationary or moving structures or objects; (3) degradation of wintering or breeding habitat through human development or habitat alteration; and (4) disturbance at nest and roost sites (Birds of North America).

On the ENF, increasing recreation use and associated disturbances at reservoirs, and habitat alteration associated with fuels reduction projects, are the primary factors influencing bald eagles or their habitat. Recreation disturbance at known nest locations has been limited through the use of area closures, but boating and campground activity may result in some degree of habitat avoidance by foraging eagles, or may result in avoidance of potential nesting habitats. Reservoirs on the ENF are small, and with existing levels of public use, do not provide large areas of undisturbed habitat. The number of nesting bald eagles on the Forest has continued to increase however, suggesting that eagles have been able to adapt to existing levels of public use. Since fuels reduction projects are not removing large trees or snags, they are generally not reducing the quality of nesting habitat, and treatments are expected to make habitat more sustainable in the event of a wildfire.

The direct and indirect effects of the project Alternatives contribute to two of the three risk factors described above. Alternative A, which has routes within 450 meters of a bald eagle nest location, results in the potential for direct disturbance to nesting bald eagles. Because Alternative A does not prohibit public wheeled motor vehicle cross-country travel, there is also a high degree of uncertainty about future route proliferation and associated cumulative impacts upon bald eagle sites. The effects of Alternative A, when combined with the effects of current and future recreation activity, may result in adverse cumulative effects. Alternatives B, Modified B, C, D, and E do not result in direct or indirect effects to known nest sites, but may influence the suitability of a substantial portion of available nesting habitat. This

The ENF Management Indicator Species (MIS) Report describes an estimated decline in the amount of bald eagle habitat on the ENF between 1991 and 1997, but an increase in the number of nesting bald eagles during the past decade. As described in the project MIS report, project alternatives can affect suitability of habitat for nesting, but will not influence measured trends in the amount of bald eagle habitat. The Biological Evaluation prepared for this project determines that the effects of the project alternatives combined with the additional activities occurring within the analysis area, are not likely to result in a loss of viability or trend toward Federal listing of the bald eagle (see Biological Evaluation).

Peregrine Falcon

One peregrine falcon eyrie (cliff nesting location) is receiving current use on the Forest. Peregrine falcon responses to disturbance appear to be highly variable and dependent upon very site-specific factors, but displacement and avoidance, and disturbance at a specific location are road or motorized trail-associated factors potentially affecting peregrine falcons (USFWS 1982).

Displacement and Avoidance and Disturbance at a Specific Location (nest sites): Reported responses of peregrine falcons to human disturbances vary with their timing and proximity to the eyrie. In the early spring courtship phase, disturbed peregrines are liable to desert an area (USFWS 1982). Birds that have been interrupted in their nest cycle by such factors as blasting, shooting, road construction, or rock climbing build up a cumulative nervousness to where a subsequent slight disturbance can cause abandonment of an eyrie (USFWS 1982). A spatial buffer of up to a mile has been recommended to avoid disturbance from OHV use (Ellis 1982). However, if cliffs are high and nesting ledges are inaccessible, "the proximity to roads, buildings, recreational sites, and other human disturbances does not prevent peregrines from successfully breeding." If cliffs are low with more easily accessible nest sites, such proximity to human activity affects the regularity of occupation and may determine whether a ledge is ever used by peregrines at all (USFWS 1982).

Direct and Indirect Effects for All Alternatives – Peregrine Falcon

Indicator Measure 1: Does not apply to Peregrine Falcon**.**

Indicator Measure 2: Does not apply to Peregrine Falcon.

Indicator Measure 3: The proportion of potential cliff nesting habitat occurring within 800 meters of an open route is analyzed to evaluate the possible influence of routes on displacement or avoidance and potential human disturbance (Table 3-I.24).

Routes open for public wheeled motor vehicle use in Alternative A occur within 0.5 mile of 26 percent of the potential cliff nesting sites identified on the ENF. Routes open for use in Alternatives Modified B, B, D, C, and E influence progressively fewer additional sites, ranging from 22 percent in Modified B to 10 percent in Alternative E. Since most cliff nesting ledges are high and inaccessible, the access that routes may provide to rock climbers and other forest users is probably a more substantial, though indirect disturbance factor that could influence peregrine nest site selection or use.

Some of the routes within 0.5 mile of potential cliff nesting sites occur near the top of the ledge nest sites, whereas other routes within the 0.5 mile radius have limited access to the potential nest sites. Routes above or within reasonable motorized vehicle access of the top of the potential nest sites pose a higher risk of disturbance.

Table 3-I.24: Percent of peregrine cliff nesting sites that occur within 800 meters of an open route

Indicator Measure 6: As listed in Table 3-I.31, Alternative B would designate 7 unauthorized routes within 0.5 miles of potential peregrine falcon cliff nesting habitat. Alternatives C, D, E and Modified B would designate between 1 and 5 routes that are within this distance of potential habitat. None of the action alternatives designate unauthorized routes within 0.5 miles of currently occupied nesting habitat.

Cumulative Effects – Peregrine Falcon

Peregrine falcon numbers have increased substantially across the United States over the past two decades. Although numbers remain low in the Sierra Nevada, they appear to be increasing as is suggested by the recent use of a new eyrie on the Forest. The following risk factors have been identified for peregrine falcons: (1) collision with stationary structures and objects (particularly transmission lines); (2) illegal shooting or collection; (3) disturbance at eyries; (4) pesticides and contaminants; and (5) degradation of habitat.

Rock climbing at the active peregrine falcon eyrie is the greatest potential threat to nesting success. To date, closures at the site and the voluntary cooperation of climbers have prevented adverse effects. Alternatives A, B, Modified B and D increase the risk of failed reproduction resulting from motorcycle noise use on route 17E12. If use is monitored, however, and if closure orders are implemented if needed to prevent breeding season disturbance, then the effects of project alternatives (including Alternatives A, B, Modified B, and D), combined with the effects of ongoing and future management activities, are unlikely to result in significant adverse effects to peregrine falcons on the ENF.

The ENF Management Indicator Species (MIS) Report describes no change to cliff-nesting habitat but an increase in the number of nesting peregrine falcon in California and on the ENF in the last 20 years. As described in the project MIS report, project alternatives can affect suitability of habitat for nesting, but will not influence measured trends in the amount of peregrine falcon nesting habitat. The Biological Evaluation prepared for this project determined that the effects of the project alternatives, combined with the additional activities occurring within the analysis area, are not likely to result in a loss of viability or trend toward Federal listing of the peregrine falcon (see Biological Evaluation).

Valley Elderberry Longhorn Beetle

Valley elderberry longhorn beetles have not been detected on the Eldorado National Forest. Suitable habitat may occur on the Forest but, to date, elderberry plants have not been found within the elevation range occupied by the species. Elderberry longhorn beetle habitat could be affected by damage to elderberry shrubs if road or trail use were to occur off of routes open for public wheeled motor vehicle use.

Direct and Indirect Effects for All Alternatives – Valley Elderberry Longhorn Beetle

Indicator Measures 1-6: Do not apply to the Valley Elderberry Longhorn Beetle.

Specific criteria were developed in coordination with the US USFWS (2006) to identify unauthorized routes that may affect the valley elderberry longhorn beetle:

- Staging areas are not within 100 feet of occupied valley elderberry longhorn beetle sites or suitable habitat of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level.
- Routes or areas are not within 20 feet of occupied valley elderberry longhorn beetle sites or suitable habitat of elderberry plants containing stems measuring 1.0 inch or greater in diameter at ground level.

Using these criteria, in the absence of additional surveys, unauthorized routes that occur within potential habitat for the Valley elderberry longhorn beetle are considered to potentially be within 20 feet of elderberry plants. These routes “may affect” the valley elderberry longhorn beetle, requiring formal consultation with the USFWS.

A determination of “may affect, not likely to adversely affect” can be made for Alternatives B, Modified B, C, D, and E based upon these criteria for unauthorized routes. In these alternatives, unauthorized routes are not open for public use within 20 feet of potential elderberry habitat. A Biological Assessment (BA) has been prepared documenting the evaluation of these criteria in relation to Modified B, the preferred alternative. The BA determines that this alternative may affect, but is not likely to adversely affect, the valley elderberry longhorn beetle.

Summary of the Effects to the Riparian Associated Species and Habitats Group

Riparian and meadow areas are particularly important habitats for birds and other wildlife in the Sierra Nevada (RHJV 2004, Graber 1996). The limited geographic extent of meadows and riparian habitats increases their importance and the implications of habitat loss or degradation to species. In most watersheds the influence of open routes within RCAs declines substantially between Alternative A and Alternative E, with a relative reduction by half. The exceptions are the RCAs in the Upper Cosumnes River watershed and the North Fork Cosumnes watershed, which remain substantially influenced by routes even in Alternative E (22 percent and 15 percent of the area within these RCAs occurs within 60 meters of a route). Alternatives B, Modified B, C, and D influence progressively less habitat in RCAs, falling between Alternatives A and E in their degree of influence. For these reasons, adverse effects associated with habitat alteration, riparian habitat fragmentation, breeding disturbance, edge effects and increased predation, particularly upon the many migratory birds using these habitats, are expected to be greatest under Alternative A and decrease incrementally (though to a lesser degree) between Alternatives B, Modified B, C, D and E.

The number of meadows affected by motorized routes declines progressively between Alternatives A, B, D, C and Modified B. Alternative E does not open routes within meadows and therefore contributes the most toward improved conditions for meadow-associated species, such as the willow flycatcher and great gray owl.

Snag Associated Species Group

Cavity Nesting Birds

Cavity nesting birds include the pileated woodpecker, Williamson’s sapsucker, red-breasted sapsucker, and hairy woodpecker. Nesting habitat for this group of MIS is provided in forested vegetation types with snags larger than 15 inches diameter. Road and motorized trail-associated factors likely to affect these species are: edge effects and the reduction of snags and down logs. Nests of cavity nesting birds are typically more secure from nest predation than other forest birds, and recreational disturbance is not known to be a limiting factor as it is for some other forest bird species (Gaines et al. 2003).

Snag and Log Reduction and Edge Effects*:* Snag and log reduction occurs as an indirect effect of managing roads or trails for public use. Trees posing a potential safety hazard (“hazard trees”) are removed along roads open for public use, as well as along roads receiving concentrated use during implementation of a specific project. Hazard trees are typically dead or dying trees that occur within a tree-height distance from the road. This safety policy results in a reduction in snags within a zone of about 60 meters from a road’s edge. Wisdom and Bate (2008) found that human access can have substantial effects on snag density. In their study area on the Flathead National Forest in Montana, stands adjacent to roads had snag densities three times lower than the snag densities within stands not adjacent to roads. Studies have shown cavity-nesting birds to decline 53 to 77 percent after snag removal (Scott and Oldenmeyer 1983, Raphael and White 1984, Hejl 1994). Wisdom and Bates (2008) concluded that meeting snag objectives for wildlife will require careful planning and effective mitigations as part of management of timber harvest and human access.

The amount of down wood is also influenced within this zone, both by the removal of hazard trees that would become future down wood, and by the access provided for woodcutters. Down wood is important as a foraging substrate, providing insects required by species like the pileated woodpecker.

Direct and Indirect Effects for All Alternatives – Cavity Nesting Birds

Indicator Measures 1 and 2: Do not apply to cavity nesting birds.

Indicator Measure 3: To evaluate potential effects of snag and down log reduction and edge effects upon cavity nesting birds, the proportion of forested habitat occurring within 60 meters of roads was analyzed (hazard tree removal rarely occurs along motorized or non-motorized trails) (Table 3-I.25). Thresholds associated with this measure have not been established, but the following snag retention guidelines are established by the ENF LRMP (ROD for the SNFPA p. 51):

- Within mixed conifer and ponderosa pine types – four of the largest snags per acre.
- Within the red fir type – six of the largest snags per acre.

Alternative A results in 17 percent of cavity nesting bird habitat occurring within a motorized route's zone of influence (about 4 percent of snag habitat is already influenced by surfaced roads). Habitat objectives for cavity nesting birds can be met by retaining greater numbers of snags outside of roadside corridors. If Alternative A is implemented, retention of an additional 0.8 snags per acre in ponderosa pine and mixed conifer types (4.8 snags per acres), and an additional 1.2 snags per acre in red fir types (7.2 snags per acre), would allow for meeting ENF LRMP guidance outside of roadside corridors. Based upon inventory data, these densities are currently met within the most broadly distributed forest types (mixed conifer/white fir), but not within the ponderosa pine or red fir types (see Forest MIS report for Cavity Nesting Birds).

Alternatives B and Modified B, C, D, and E result in progressively lower proportions of cavity nesting bird habitat that would be influenced by motorized routes (Table 3-I.25). These Alternatives, including Alternative E which influences about 10 percent of potential snag habitat on NFS lands, have a relatively low level of influence on total amounts of habitat for cavity nesting birds or other snag-associated species such as bats. If any of the action alternatives were implemented, habitat objectives can be met by retaining greater numbers of snags outside of a 60 meter roadside corridor (Table 3-I.26). Based upon inventory data, the densities displayed for all alternatives are currently met within the most broadly distributed forest types (mixed conifer/white fir), but are not met within red fir type or the ponderosa pine type (see Forest MIS report for Cavity Nesting Birds).

Table 3-I.25: Percent of cavity nesting bird habitat occurring within 60 meters of a motorized route

Analysis Area	Acres of Habitat	Surfaced Roads	Percent Cavity Nesting Bird Habitat					
			Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
Habitat on NFS	370,017	4	17	13	13	12	11	10
Habitat on All Lands*	485,992	4	20	16	17	16	15	14

*Includes habitat on all lands occurring within the National Forest boundary.

Table 3-I.26: Snag retention required on other lands to compensate for hazard tree removal from roadside corridors

Forest Type	Surfaced Roads	Snags per Acre					
		Alt A	Alt B	Mod B	Alt C	Alt D	Alt E
MC/PP	4.2	4.8	4.6	4.6	4.6	4.5	4.4
Red Fir	6.3	7.2	6.8	6.8	6.8	6.7	6.6

(based upon meeting snag density guidance in the ENF LRMP).

Indicator Measures 4-6: Do not apply to cavity nesting birds.

Cumulative Effects – Cavity Nesting Birds

Wildfire, insects, disease, and lighting are the primary agents resulting in the creation of snags, and these factors naturally vary across forest types and time. In addition to hazard tree removal along roads open to the public, a number of additional activities result in regular removal of snags. On NFS lands, dead trees are removed during hazardous fuels reduction projects when they are considered a safety hazard to the logging operations. Hazard tree removal occurs both within the units being treated and along roads being used as haul routes. Forest thinning also reduces stand density which in turn reduces the amount of future mortality likely to occur within thinned stands. Forest thinning treatments have occurred on approximately 57,500 acres over the past decade. Thinning treatments will continue to be the primary management activity affecting cavity nesting bird habitat on the NEF and will occur on about 20,000 acres over the next several years (Appendix E).

Three large wildfires have occurred on the ENF over the past decade, and have burned a total of about 30,700 acres on both public and private lands. Salvage sales targeting the removal of dead trees have occurred on the vast majority of private land acreage within these fires. Approximately half of the 20,600 acres that burned on NFS lands in these fires was salvage logged. Habitat availability for cavity nesting birds increased in response to each of these fires; but whether or not the pulses of snag habitat that are created by these fire events are similar to conditions that would have occurred historically, remains uncertain (Hutto 1995, Hejl 1994, Hutto 2006).

Private lands occupy about 193,000 acres within the 798,275 acre cumulative effects analysis area. The majority of these lands are commercial timberlands where dead trees are often removed to increase the cost-effectiveness of timber extraction and if they are considered a safety hazard to the logging operation (Cline et al. 1980). In intensively managed forests, rotation ages are often too short for large snags to develop (Cline et al. 1980). Large snags will be substantially reduced or absent from such managed forests. CDF currently lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted.

Based upon Forest inventory plot data, minimum snag densities recommended in the ENF LRMP (four snags per acre within mixed conifer and ponderosa pine types, and six snags per acre within red fir type) are met within the mixed conifer and red fir types, but not within the ponderosa pine type (see the ENF MIS Report, 2007). Although the project alternatives affect the availability of snags within an estimated 10 to 17 percent of habitat available to cavity nesting birds, these effects could be compensated for by adjusting other activities (primarily salvage sales) to retain slightly higher numbers of snags in areas that occur outside of roadside buffers (as shown in Table 3-I.26 above). Based upon existing snag densities, the combined effects of the project alternatives and other activities may result in adverse cumulative effects to cavity nesting birds within the ponderosa pine type, but this does not appear to be the case in the more predominant mixed conifer or red fir forest types.

As described in the project MIS report, project alternatives will reduce the amount of cavity nesting bird habitat on the Eldorado National Forest. Project-level impacts would not be expected to alter estimated population declines of the red-breasted sapsucker and pileated woodpecker, nor the estimated stable or increasing populations of the Williamson's sapsucker and hairy woodpecker, because of the limited area affected (10 to 17 percent of available habitat affected). Retention of additional snags outside roadside corridors can partially compensate for reductions along roadside corridors.

Pallid Bat

The pallid bat is likely to be affected by the reduction of snags. Other road and motorized trail-associated factors are unlikely to affect the pallid bat.

Snag Reduction: The pallid bat, and many other species of bats that roost in snags, would be affected by hazard tree removal occurring along roadsides. These effects would be the same as described above for cavity-nesting birds. Since the pallid bat tends to be a roosting habitat generalist, using many different natural and man-made structures, the magnitude of effect may be slight. The species is thought to be highly sensitive to human disturbance at roosts, although pallid bat roost sites are unknown on the ENF.

Direct and Indirect Effects for All Alternatives – Pallid Bat

The effects of project alternatives upon snag availability are the same as described for cavity nesting birds. Since pallid bats are roosting habitat generalists, the magnitude of these direct and indirect effects are not expected to substantially affect this species.

Cumulative Effects – Pallid Bat

Cumulative effects upon snag habitat are the same as those described for cavity nesting birds. The combined effects of the project alternatives and other activities are unlikely to result in substantial adverse effects to this species because unlike cavity nesting birds, the pallid bat can use other structures besides snags for roosting. For this reason (as described in the project Biological Evaluation), project Alternatives may affect individuals but are not likely to result in a loss of viability or trend toward Federal listing for the pallid bat.

Table 3-I.27: Unauthorized routes bisecting old forest patches and within the Old Forest Emphasis Area (OFEA) land allocation.

Route Number	Alt B	Mod B	Alt C	Alt D	Alt E	In OFEA
NSR0930-C	Yes	Yes	Yes	Yes	Yes	
NSR0930-K	Yes	Yes	Yes	Yes	Yes	
NSR0930-L	Yes	Yes	Yes	Yes	Yes	
NSR0930L-A	Yes	Yes	Yes	Yes	Yes	
NSR0938-A	Yes	Yes	Yes	Yes	Yes	
NSR1046-A	Yes	Yes	Yes	Yes	Yes	
NSR1230D-A	Yes	Yes	Yes	Yes	Yes	
NSR1393-A	Yes	Yes	Yes	Yes	No	
NSR0916-A	Yes	Yes	Yes	Yes	Yes	Y
NSR1046-C	Yes	Yes	Yes	Yes	Yes	
NSA1140-A	Yes	Yes	No	Yes	Yes	
NSA1180A-A	Yes	Yes	No	Yes	Yes	
NSA1256-A	Yes	Yes	No	Yes	Yes	
NSA1112-A	Yes	No	No	Yes	No	
NSR1358J-A	Yes	No	Yes	Yes	Yes	
NSA0914M-B	Yes	No	Yes	Yes	No	Y
NSR0930-N	Yes	No	Yes	Yes	No	
NSR0930-A	Yes	No	Yes	Yes	Yes	
NST1643-A	Yes	No	Yes	Yes	No	Y
NSA1377B-A	Yes	No	No	Yes	No	Y
NSA1408A-A	Yes	No	No	Yes	No	Y
NSR1135-A	Yes	No	No	Yes	No	Y
NST1640-D	Yes	No	No	Yes	No	Y
NSA1112-AA	Yes	No	No	Yes	No	
NSA1178-A	Yes	No	No	Yes	No	
NSA1763-A	Yes	No	No	No	No	Y
NSR1156-A	Yes	No	No	No	No	Y
NSR12Y32A-A	Yes	No	No	No	No	Y
NSR12Y32A-A	Yes	No	No	No	No	Y
NSR1439-A	Yes	No	No	No	No	Y
NSR1439-B	Yes	No	No	No	No	Y
NSR1155-A	Yes	No	No	No	No	Y

Table 3-I.28: Unauthorized routes occurring within spotted owl PACs.

Route Number	Alt B	Mod B	Alt C	Alt D	Alt E	Total Route Length (miles)
NSA0914M-A	Yes	No	No	No	No	0.29
NSA0914M-B	Yes	No	Yes	Yes	No	0.24
NSA1377B-A	Yes	No	No	Yes	No	0.20
NSA1408A-A	Yes	No	No	Yes	No	0.18
NSR0850-A	Yes	No	No	No	No	0.10
NSR1046-A	Yes	Yes	Yes	Yes	Yes	5.88
NSR1046-C	Yes	Yes	Yes	Yes	Yes	2.09
NSR1155-A	Yes	No	No	No	No	0.96
NSR12Y32A-A	Yes	No	No	No	No	0.84
NSR12Y32A-A	Yes	No	No	No	No	0.84
NSR1358J-A	Yes	No	Yes	Yes	Yes	0.37
NSR1409-A	Yes	No	No	Yes	No	0.13
NST1640-D	Yes	No	No	Yes	No	0.32

Table 3-I.29: Unauthorized routes occurring within goshawk PACs.

Route Number	Alt B	Mod B	Alt C	Alt D	Alt E	Total Route Length (miles)
NSA1178-A	Yes	No	No	Yes	No	1.79
NSR0930-A	Yes	No	Yes	Yes	Yes	1.06
NSR1109A-A	Yes	Yes	Yes	Yes	No	0.11

Table 3-I.30: Unauthorized routes in meadows.

Route Number	Alt B	Mod B	Alt C	Alt D	Alt E	Total Route Length (miles)
NSA1112-A	Yes	No	No	Yes	No	1.58
NSA1004-A	Yes	No	No	Yes	No	0.34
NSR0983-B	Yes	No	No	Yes	No	0.08
NSR0983-C	Yes	No	No	Yes	No	0.13
NSA1234-A	Yes	No	No	Yes	No	0.47
NSA1112-AA	Yes	No	No	Yes	No	0.39
NSR1439-A	Yes	No	No	No	No	1.05
NSR1439-B	Yes	No	No	No	No	0.16
NSR0983-A	Yes	No	No	Yes	No	0.06
NSR1013-A	Yes	No	No	Yes	No	0.15
NSA1025-A	Yes	No	No	Yes	No	0.09
NSR1439-CA	Yes	No	No	No	No	0.58

3-I.31: Unauthorized routes within 0.5 miles of peregrine falcon cliff nesting habitat

Route Number	Alt B	Mod B	Alt C	Alt D	Alt E	Total Route Length (miles)
NSR1408-A	Yes	Yes	Yes	Yes	Yes	0.23
NSR1319A-C	Yes	Yes	No	Yes	Yes	0.25
NSR0983-B	Yes	Yes	No	Yes	No	0.08
NSR0983-C	Yes	Yes	No	Yes	No	0.13
NSRCA-88-C	Yes	Yes	No	No	No	1.19
NSA1763-A	Yes	No	No	No	No	1.78
NST1763-A	Yes	No	No	No	No	4.64

J. Aquatic Wildlife

Affected Environment

The Sierra Nevada bioregion has numerous major rivers, hundreds of lakes, and thousands of miles of streams that form 31 watersheds (Sierra Nevada Conservancy 2006). Sixty percent of California's water originates from the Sierra Nevada (Sierra Nevada Research Center, no date). Over the last 150 years, anthropogenic disturbances throughout the Sierra Nevada, such as dam construction, have altered water temperatures, water volume, stream-flow patterns, and quantities of organic matter and nutrients of many streams (Kattelmann and Shilling 2004). Additionally, introduction of non-native fish into streams that were historically fishless has altered many aquatic systems. The Sierra Nevada Ecosystem Project (SNEP 1996a) noted that across the Sierra Nevada bioregion, aquatic/riparian systems are the most altered and impaired habitats – "Riparian areas have been damaged extensively by placer mining (northern and west-central Sierra) and grazing (Sierra-wide), and locally by dams, ditches, flumes, pipelines, roads, timber harvest, residential development, and recreational activities " Similarly, herpetofauna[1] populations have severely declined throughout the Sierra Nevada at all elevations. Local degradation of habitats has led to significant affects on aquatic macroinvertebrates, which are one of the best indicators of the health in Sierran aquatic systems.

Aquatic features found on the Eldorado National Forest include both lotic (moving water) and lentic (still water) systems. Within the administrative boundary, there are 1,251 miles of perennial stream, 10,416[2] acres of meadow, and 1,108 lakes ranging in size from less than 1 acre to over 2,740 acres in size. Presently on the Eldorado National Forest, rainbow trout are known to occupy 361.50 miles of stream and are suspected to be present in 162.11 miles of stream. Brown trout are known to occupy 266.66 miles of stream and are suspected to be present in an additional 174.52 miles of stream, and brook trout are known to occupy 54.97 miles of stream and are suspected to be present in an additional 35.27 miles of stream.

As is the case across the Sierra Nevada, aquatic features and riparian areas within the ENF have been affected to varying degrees by mining, dams and water impoundments, ditches, flumes, roads, timber harvest, and recreation, including OHV use. Additionally, native aquatic and aquatic-dependent species on the Forest have been adversely affected by introductions of non-native species such as smallmouth bass (*Micropterus dolomieu*), bullfrogs (*Rana catesbeiana*), and crayfish (various species).

Riparian Conservation Objective analyses conducted on 32 stream reaches on the ENF in 2006 indicated that approximately 66 percent of the streambanks were unstable. Sediment delivery to aquatic features was noted in approximately 60 percent of the surveyed reaches[3]. Similarly, 11 sites were evaluated using the Proper Functioning Condition (PFC) method of riparian-wetland condition rating between 2004 and 2006. One site was rated as properly functioning, five sites

[1] Includes both amphibians and reptiles.

[2] There are approximately 1,857 meadows on the ENF. They range in size from less than 1acre to a maximum size of 274 acres. The average meadow size on the Forest is approximately 5.6 acres.

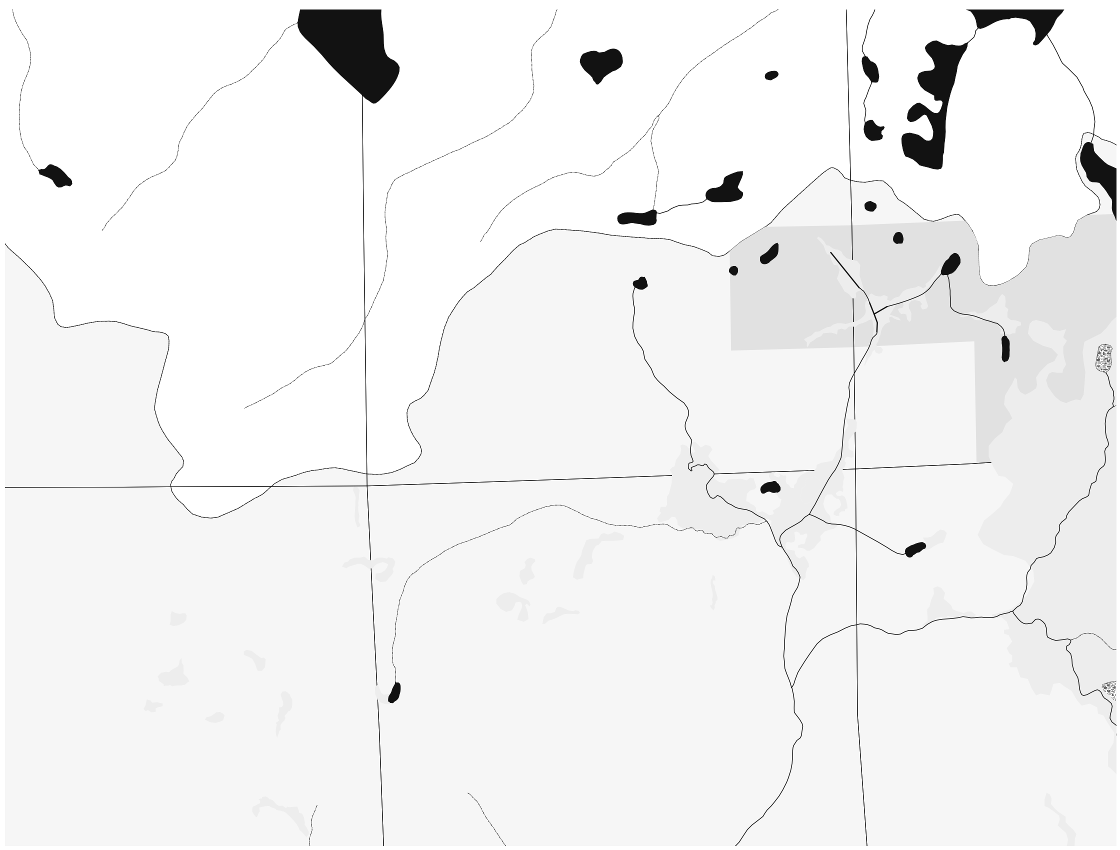
[3] These results reflect a small sample size (number of streams analyzed vs. the length of stream present on the forest); however, these data do suggest an overall trend that corresponds to observed trends.

were rated as functioning at risk, and five sites were rated as non-functional. Improvement over the past condition was observed in three riparian-wetland areas that were monitored during 2005[4] (e.g., stabilization of headcuts, reduction in number of channels, etc.).

Aquatic systems of special note on the ENF are the Little Indian Valley Critical Aquatic Refuge, the Jones Fork of Silver Fork (above Union Valley Reservoir), North Fork American River, North Fork Mokelumne River, Rock Creek, and the Rubicon River.

The Little Indian Valley Critical Aquatic Refuge which is approximately 762 acres in size was designated under the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision for the protection of the mountain yellow-legged frog (Figure 3-J.1).

Figure 3-J.1: Area map of Little Indian Valley Critical Aquatic Refuge.



The Jones Fork of Silver Fork (above Union Valley Reservoir), North Fork American River, North Fork Mokelumne River, Rock Creek, and Rubicon River have been identified by the Sierra Nevada Ecosystem Project as potential Aquatic Diversity Management Areas (Moyle 1996). The management goal of these aquatic ecosystems is the protection of aquatic biodiversity.

The Rubicon River, from its confluence with the Middle Fork American River upstream to Hell Hole Reservoir, has been designated by CDFG as a Wild Trout Stream. Additionally, this reach of the Rubicon River has been recommended for Wild and Scenic River designation in the ENF LRMP (as modified through The Chief's July 16, 1991, Decision on appeals) and is listed in the USFWS Nationwide Rivers Inventory (USDI National Park Service 2005). This segment of the Rubicon River is considered scenic because of its outstanding trout fisheries (see the Wild and Scenic River section).

Analysis Framework

The project area includes all NFS lands within the administrative boundary of the Eldorado National Forest. The geographic extent of the direct, indirect, and cumulative effects analysis is generally confined to aquatic features of watersheds within this administrative boundary[5]. However, because this project may affect larger aquatic systems downstream from the project area, the following lotic systems are also included: the Cosumnes River (North and Middle Forks) downstream to the Forest boundary, the Mokelumne River downstream to Tiger Creek Forbay, the North Fork American River downstream to Otter Creek, and the South Fork American River downstream to Slab Creek Reservoir.

The area of analysis was chosen based on the potential for motorized routes on NFS lands to affect aquatic systems when compared to anthropogenic disturbance on adjoining private lands. It assumed that motorized routes located in watersheds on the ENF that influence larger riverine systems such as the Cosumnes, North Fork American, and Rubicon Rivers could have a measurable influence on these systems immediately adjacent to and downstream of the Forest. It is also assumed that the potential for disturbance of smaller streams is higher on private lands than on NFS lands managed under the Sierra Nevada Forest Plan Amendment. Therefore, this analysis will focus mainly on stream channels within the administrative Forest boundary, except in the case of larger riverine systems.

This analysis includes portions of four major drainage basins: the North Fork American River, the South Fork American River, the Cosumnes River, and the Mokelumne River. These four drainage basins include 155 watersheds (7th field or HUC 7 watersheds).

Data & Methods

Conclusions reached in the Riparian Conservation Objective analysis (available in the project record) were based on data obtained from a number of sources; however, the majority of data sets were derived from GIS queries. Although the USDA Forest Service uses the most current and complete data available, data and product accuracy may vary based on differences in source accuracy, modeling or interpretation, and/or errors incurred while data sets were being created or revised.

5 The direct and indirect effects of motorized vehicle travel in the Rock Creek area are described in detail in a separate document.

Threshold metrics for the data sets being analyzed have not been established across the bioregion due to the variability in soils, geology, and hydrology. However, stream system scale threshold metrics can be established to provide a tool that serves to display the differences between the alternatives as well as providing a basis to determine consistency with the Riparian Conservation Objectives established by the Sierra Nevada Forest Plan Amendment Record of Decision of (USDA FS 2004a).

Existing information was used to make determinations in the Aquatic Species Biological Evaluation and in evaluating the Sierra Nevada Forest Plan Amendment Riparian Conservation Objectives and their associated Standards and Guidelines. This analysis acknowledges the following.

- The probability of detection for visual encounter herpetofauna survey is approximately 75 percent when the species is present, depending on the surveyor’s experience and the species in question (Manley pers. comm.). Even though the probability of detection increases with multiple surveys, failure to detect a species does not mean the species is not present.
- Herpetofauna observation data has been collected forest-wide; however, surveys tended to be associated with specific management activities such as fuels treatments and timber harvest. Additionally, not all streams were surveyed with the same degree of intensity. Therefore, because herpetofauna surveys were generally associated with land management activities and not distributed across all forest land allocations, the forest-wide range and distribution, as well as the population size, of an individual species may be understated. Thus, this analysis generally focuses on potential effects to aquatic species based on likely habitat alteration.

Assumptions

A listing of general assumptions is provided at the beginning of Chapter 3. The following lists assumptions that are specific to aquatic wildlife[6].

- Habitats for the species being analyzed were assumed to be occupied if they contained the necessary life history elements.
- Human-caused disturbances near small streams in mountainous terrain disrupt natural biological processes and have the potential to adversely affect biological characteristics and fragment habitats.
- Research has concluded that sediment from roads can result in adverse effects to streams and aquatic habitats (Dissmeyer 2000, Gucinski and others 2001, Meahan 1991).
- Unpaved roads located near or that cross small streams in mountainous terrain can result in adverse effects to aquatic habitat (see the Hydrology and Aquatic Resources section of this document).
- Hazard tree removal will occur on Maintenance Level 2 routes and above; the sphere of influence resulting from hazard tree felling is approximately 200 feet from the centerline of the route (i.e., approximately one tree height). However, alteration in riparian habitat condition and functionality within the Riparian Conservation Area as a result of hazard

[6] Additional information on the assumptions used for determining streams/stream segments at high risk to adverse effects to aquatic habitats from unpaved roads can be found in the Hydrology section of this document and in The Riparian Conservation Objective analysis (see the Project Riparian Conservation Objective analysis in the project record).

tree removal will be minimized because all felled trees will remain in place unless a site-specific analysis by appropriate resource specialists determines removal is appropriate.

- The overall effect of roads to aquatic habitats is related to the amount of sediment movement from road surfaces, which is highly variable and is related to levels of maintenance, road drainage, and type of use (Clinton and Vose 2003, Maholland 2002, Maholland and Bullard 2005).
- The reduction or elimination of vehicle traffic on a road near a stream will result in less sediment delivered from the road to the stream (see the Hydrology and Aquatic Resources section of this document).
- Effects from the type of road use (cars, trucks, motorcycles, all-terrain vehicles, etc.) and the amount of road use on top of snow is generally minor when compared to the proximity and length of unpaved roads relative to stream channels and the number of times unpaved roads cross the stream.
- The elimination of vehicle traffic on a road near a stream during periods of wet road conditions will result in less sediment being delivered from the road to the stream. Vehicle use on wet roads has the potential to cause ruts and damage to the roads with a resultant increase in erosion of sediment from the road during rainfall events and periods of snowmelt (see the Hydrology and Aquatic Resources section of this document).
- The density of roads and trails at the watershed scale will not be substantially changed as a result of any of the action alternatives for at least the next 20 years because all of the action alternatives involve the closure of roads and unauthorized routes to vehicle use by the public rather than the physical removal of roads.

Because of the limitations described above, the analysis provided here is a relative risk assessment of each of the action alternatives compared to the No Action alternative.

Indicator Measures

The following indication measures were developed to assess the potential of motorized route designation to adversely affect aquatic and aqua

Indicator Measure 2: Unpaved routes bisecting or going through meadows.

Indicator Measure 3: Routes within RCAs.

Indicator Measure 4: Consistency with RCOs in the SNFPA.

Indicator Measure 5: Direct/Indirect effects of routes open for public wheeled motor vehicle use on the California red-legged frog and its habitat.

Indicator Measure 6: Routes or portions thereof open for public wheeled motor vehicle use within potential foothill yellow-legged frog habitat.

Indicator Measure 7: Routes or portions thereof open for public wheeled motor vehicle use in mountain yellow-legged frog habitat.

Indicator Measure 8: Routes or portions thereof open for public wheeled motor vehicle use in areas where Yosemite toads/toad hybrids have been detected.

Indicator Measure 9: Potential of routes open for public wheeled motor vehicle use to adversely affect the western pond turtle.

Indicator Measure 10: Routes or portions thereof having the potential to elevate in-channel sediment in hardhead fish habitat.

Indicator Measure 11: Routes or portions thereof having the potential to elevate in-channel sediment in trout habitat.

Environmental Consequences

All Species

Amphibians such as frogs have several natural history characteristics that make them susceptible to habitat disturbance. In addition to being ectotherms that are sensitive to small changes in ambient air and water temperatures, they have two distinct life phases. The larval life phase is wholly aquatic, and the second life phase that occurs after metamorphosis is semi-aquatic to terrestrial, depending on species. Thus, amphibians can be affected by disturbance to both aquatic and/or riparian terrestrial habitats. Amphibians tend to exhibit high habitat specificity and low mobility, further reducing their ability to adapt to disturbance (USDA FS 2001).

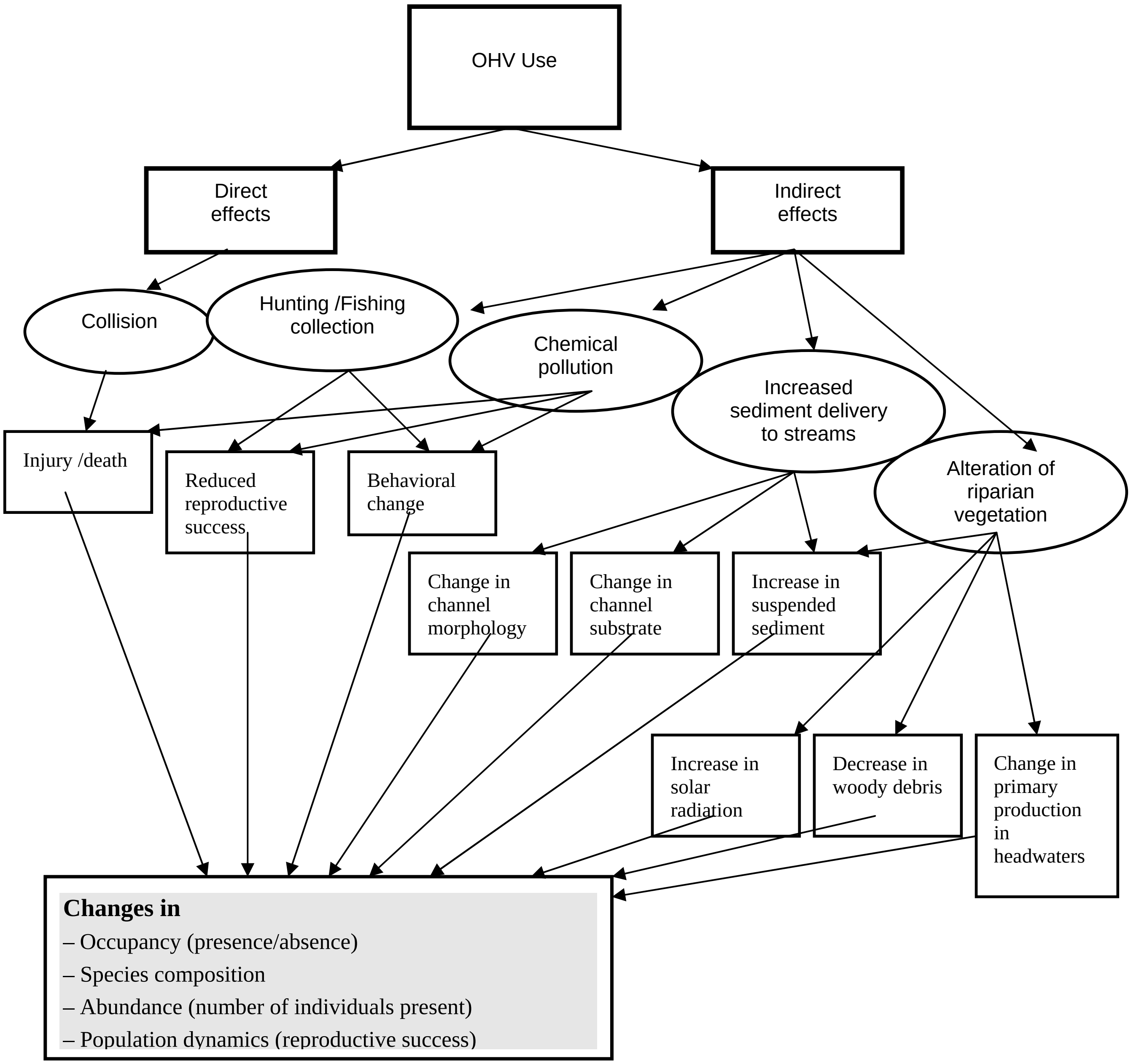
Like amphibians, some reptiles, such as western pond turtles, rely on both aquatic and terrestrial habitats to sustain their populations. Western pond turtle eggs are laid in terrestrial nests and after incubation, hatchlings migrate to aquatic habitats. Similar to amphibians, hatchlings tend to exhibit high habitat specificity and low mobility (Ashton and others 1997).

Because of their susceptibility to both terrestrial and aquatic habitat changes, declines in some herpetofauna populations have been attributed in part to anthropogenic disturbances such as road building and associated recreational activities. Various studies have demonstrated that sediment delivery to stream channels in a forested environment is correlated to road surface type, physical characteristics of the adjacent areas (e.g., litter depth, coarse wood), soils (erodibility), the steepness of slope below the road, and vehicle usage (Chin and others 2004, Clinton and Vose 2003). Other factors that contribute to in-channel sediment delivery include the number of stream crossings on a channel, the condition of the stream approach, and the road length draining into the stream channel crossing. Markman (2008) notes that for small streams in mountainous terrain, unpaved roads located near the stream can result in adverse effects to aquatic habitats. Additionally, Markman (2008) states unpaved roads that cross small streams in mountainous terrain have the potential to adversely affect aquatic habitats by elevating fine-grained sediment delivery to stream channels. The effects of elevated sediment in aquatic systems can influence in-stream primary production and macroinvertebrate assemblages which in turn can affect downstream fish and herpetofauna populations. Fine-grained sediment may also envelop eggmasses, reducing the reproductive success of aquatic species.

Road maintenance and use can affect adjacent vegetation as well. Reductions in vegetation along roads resulting from hazard tree removal and road-associated recreation use may create edge effects that alter community structure due to soil compaction, increased solar radiation, and wind. Increases in soil compaction, combined with increases in solar radiation, have the potential to increase soil temperatures and decrease soil moisture, thereby reducing habitat suitability for aquatic, aquatic-dependent, and riparian dependent species such as salmonids, amphibians, and aquatic-dependent reptiles.

In addition to changes in hydrology and stream morphology due to human activity, native herpetofauna populations throughout the Sierra

Figure 3-J.2: Analysis framework for direct and indirect effects determinations of OHV use on herpetofauna (after Craig and others, In prep).



Indicator Measure 1: At the *forest scale*, although there would be a slight reduction in the number and length of streams at a high risk of adverse effects to aquatic habitat when compared to Alternative A, it does not appear that there would be discernable differences between Alternatives B, Modified B, C, D, and E in terms of their direct and indirect effects on aquatic-species and aquatic-dependent species and their habitats (see the Hydrology and Aquatic Resources section of this document for more information on scale).

At the *drainage basin scale*, for all the action alternatives, a reduction in the length of streams at a high risk of adverse effects to aquatic habitat would be realized. Most of the decrease in the miles at high risk would occur in the South Fork American River (105 miles to less than 40 miles) and Cosumnes River drainage basins (85 miles to less than 60 miles). The primary reason for this is that over 87 percent of the stream miles at high risk are in these two drainage basins.

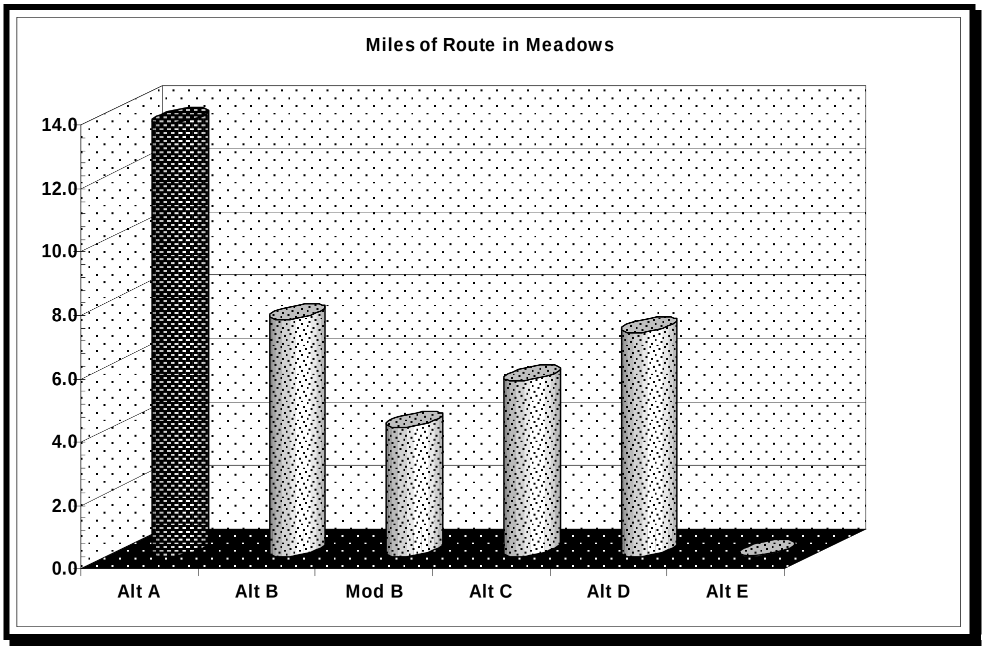
At the *stream system scale*, for most stream systems all of the action alternatives would result in less than a 10 percent reduction in the miles of streams at high risk of adverse effects to aquatic habitat from designated unpaved motorized routes. A 16 to 77 percent reduction in the length of streams at a high risk of adverse effects from unpaved roads would be realized in the following systems: Silver Fork American River, Alder Creek, Camp Creek, and the North Fork Cosumnes River. The greatest reduction in streams at high risk to adverse affects to aquatic environments would occur under Alternative E (48-77 percent reduction) followed by Modified B (32-50 percent reduction) (see the Hydrology and Aquatic Resources section of this document for additional information). The system with the greatest overall reduction in lengths of stream at high risk for adverse affects to aquatic environments is the North Fork Cosumnes River with a 47-68 percent reduction.

At the *stream system scale*, under all of the action alternatives a slight decline in the number of streams at a high risk of adverse effects from unpaved roads would be realized in the following stream systems: Silver Creek, Slab Creek Reservoir, Steely Fork Cosumnes River, Dogtown Creek, and the Middle Fork Cosumnes River (see the Hydrology and Aquatic Resources section of this document for additional information).

In summary for Indicator Measure 1, the differences in the alternatives become more pronounced as the scale decreases. At the forest scale, there are minor differences in the number and length of streams at a high risk under Alternatives B, Modified B, C, and D. At the drainage basin scale, differences in the number and length of streams at a high risk of adverse effects from unpaved roads are more discernable. However, at the stream system scale, considerable differences between the action alternatives can be observed in some systems.

Indicator Measure 2: Each of the action alternatives except Alternative E would propose system routes through meadows (Figure 3-J.3). A GIS analysis identified approximately 38 system routes/route segments that entered meadow systems (see the Project Riparian Conservation Objective analysis which is a part of the project record). Approximately 74 percent of the routes bisected one or more meadows with the remainder bordering the edge of one or more meadows. Alternative B would propose to designate approximately 7.5 miles of system routes through meadows, with Alternatives Modified B, C, and D designating 4.1 miles, 5.5 miles, and 7.1 miles respectively.

Figure 3-J.3: Length of ML-1 and ML-2 motorized route going through meadow systems

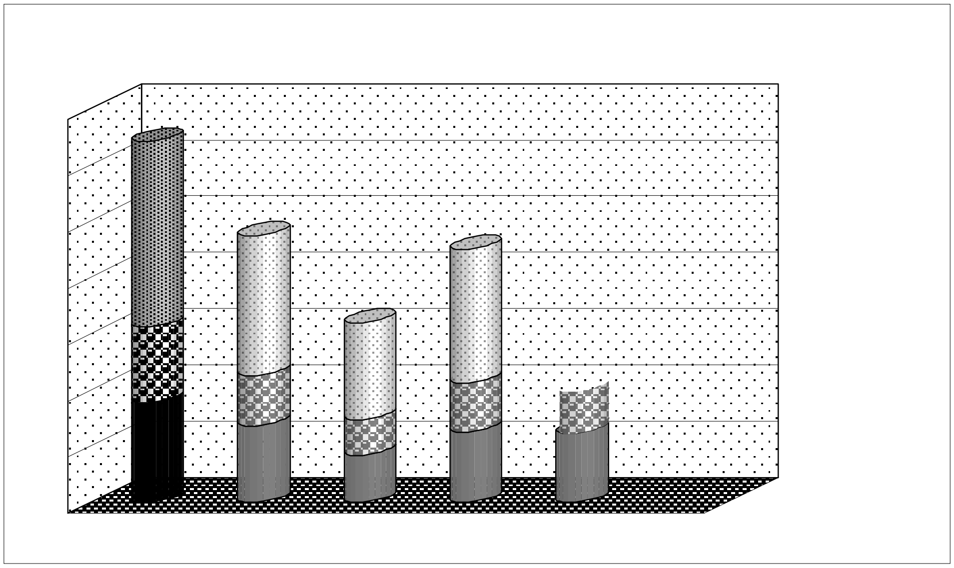


Nine system trails were identified as bisecting 37 meadows (see the Project Riparian Conservation Objective analysis which is a part of the project record). Similarly, three unauthorized routes were identified as bisecting three meadows. Subsequent analysis determined that the system trails and unauthorized routes that bisected meadows are likely to be adversely affecting meadow hydrology.

Based on the above, since routes in meadows have the potential to disrupt surface flow patterns, disrupt the movement of ground water, deliver sediment into the meadow, and cause rills and gullies, under Alternative E meadow systems would benefit most because no ML-1 or ML-2 system routes or unauthorized motorized routes would bisect meadows. Alternative Modified B would propose to designate the least amount of system routes through meadows while Alternatives B and D would have greatest length of system routes open to motorized use in meadows.

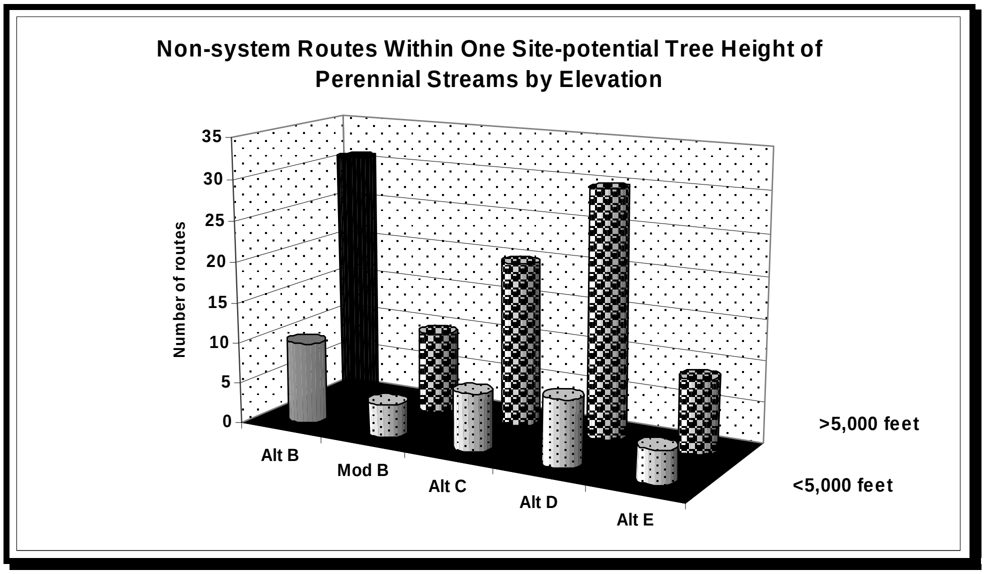
Indicator Measure 3: Within the Riparian Conservation Area, construction, maintenance, and use of roads has the potential to alter and/or reduce vegetative components such as canopy cover, vertical vegetative structure, and/or ground cover. When such changes occur within one tree height of streams, there is an elevated potential for the resulting increase in solar radiation to raise water temperatures, affect behavior or presence of aquatic organisms, and/or alter riparian and aquatic vegetation composition. Increases in solar radiation can result in conditions that tend to favor upland species over riparian species; this change in vegetation has the potential to alter macroinvertebrate assemblages resulting in changes to the food chain well downstream of the occurrence. Forest-wide, the length of route proposed for motorized use in Riparian Conservation Areas is the greatest in Alternative A with Alternatives Modified B and E proposing the least amount of route (Figure 3-J.4).

Figure 3-J.4: Length of motorized routes proposed for designation in Riparian Conservation Areas by alternative



Conservation Objectives were not designated for public motorized vehicle use in Alternatives Modified B and E. Consequently a discernable reduction in route length in the Riparian Conservation Areas of perennial streams can be observed (Figure 3-J.5).

Figure 3-J.5 Designated unauthorized routes within on site-potential tree height of perennial streams by alternative across the forest by elevation



Indicator Measure 4: The Riparian Conservation Objective analysis conducted for this project (which is a part of the project record) indicates that all of the action alternatives would represent an improvement over the existing condition and move the route system in a positive direction toward meeting the Riparian Conservation Objectives. However, only Alternatives Modified B and E would meet all the Riparian Conservation Objectives[10]. Consistency with the Riparian Conservation Objectives would ensure that the physical and biological characteristics associated with aquatic habitats would be adequately protected in order to support viable populations of riparian-dependent and aquatic species.

The primary reasons Alternatives B, C, and D did not meet the Riparian Conservation Objectives were due to the designation of routes in meadows and unauthorized routes in Riparian Conservation Areas that were within one-site potential tree height of a seasonal or perennial stream channel (see Indicator Measure 3). However, in addition to unauthorized routes within Riparian Conservation Areas, two of the six alternatives propose to authorize motorized routes within the Little Indian Valley Critical Aquatic Refuge (Table 3-J.1). Alternative A would allow travel by all vehicles on approximately 1.5 miles of road. Alternative B would allow motor vehicle travel on approximately 0.6 miles of road; Modified B, C, D, and E would not authorize motorized use on any routes within the CAR. Thus, Alternatives Modified B, C, D, and E would be consistent with the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental

[10] As noted in Indicator Measure 2, Alternative Modified B includes routes through meadows. These routes were not considered inconsistent with the Riparian Conservation Objectives under the criteria established for the analysis (see the Riparian Conservation Objective analysis for more information).

Impact Statement Record of Decision Standard and Guideline #92 which states "Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with riparian conservation objectives and the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent pant and animal species (USDA 2004b, pg. 62)."

Cumulative Effects Common to All Species for All Alternatives

The cumulative effects analysis includes all permanent and seasonal aquatic features and all Riparian Conservation Areas within the project area[11]. In assessing cumulative effects, impacts of past actions were included if the actions were implemented after 1996. Actions preceding that date were included only if they had the potential to influence species population dynamics, species habitat (e.g. in-channel large woody debris and/or sediment delivery to streams), or general watershed condition. Impacts of reasonably foreseeable future actions (within the next 10 to 15 years) were considered (including both natural and human-caused disturbances) based on their probability of influencing species populations and/or aquatic community components, particularly riparian vegetation, vegetation in and adjacent to special aquatic features, and sediment delivery to streams. The temporal scope for past actions was selected based on the assumption that any additional land management disturbances such as plantation maintenance or fuels reduction would be analyzed under the guidelines of the Sierra Nevada Forest Plan Amendment, and that lingering effects of older major activities are small compared to more recent past activities (such as wildfires, clearcuts). The temporal scope for future disturbances was based on those management actions for which Proposed Actions had been developed.

In the discussion below, it is acknowledged that region-wide and worldwide influences may have or are continuing to have an adverse affect on aquatic and aquatic-dependent herpetofauna populations (Hanski 1989, Sjogern 1991). Understanding the extent to which these factors may have affected local herpetofauna populations in the analysis area is beyond the scope of this analysis; so too is an analysis determining the extent to which these factors will continue to affect local populations. The following provides a discussion of actions that have the potential to contribute incrementally to aquatic community alterations. A detailed listing of past, present, and foreseeable future land disturbances can be found in Appendix E.

Past Land Disturbances: To varying degrees, since the late 1800s, timber harvest, mining, road building, recreation, OHV use, and human settlement have occurred throughout the analysis area. This is particularly true of the lands on the western edge of the ENF where numerous private lands adjoin NFS lands.

Throughout time, fire has also been an integral process that has shaped the landscape. Within the analysis area, in addition to fire, human activities such as dam building[12], road construction, and timber harvest have altered and fragmented aquatic habitats. During the past decade, timber harvest protective measures in riparian areas have become more restrictive. Although timber harvest plans on private land have had stream buffer requirements that protect the streams, the intensity and size of these activities vary. In many cases, harvest has resulted in fragmentation of habitat for many aquatic and riparian dependent species.

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[11] Draws, swales, and ephemeral drainages were not included in the GIS data sets.
[12] Several of the major rivers contain one or more dams. These include the North Fork American River, the South Fork American River, and the Mokelumne River.

Within the analysis area on NFS lands, timber harvests and fuels projects have occurred for several decades. Within the past 10 years, approximately 114 fuels projects and/or timber sales have affected approximately 57,917 acres of land (Appendix E). Since 2001, timber sales on NFS lands have been subject to the Standards and Guidelines in the Sierra Nevada Forest Plan Amendment (USDA FS 2001a, 2004b, 2004c). As such, they have been subject to landscape and project-level analysis that includes a Riparian Conservation Objective analysis. Because the Riparian Conservation Objective analysis assesses and documents aquatic conditions prior to implementation of management activities, and includes development of measures to minimize disturbance in Riparian Conservation Areas, it is assumed that timber sales and fuels projects developed under this amendment have minimized adverse affects to aquatic resources.

The degree to which historic anthropogenic disturbances have affected herpetofauna populations and their habitat cannot be precisely quantified; however, as indicated above, recent surveys have indicated that aquatic features on the ENF have degraded to some extent as a result of land use and land management disturbances.

In the past, restoration of stream channels in disturbed areas has generally been passive (i.e. stream channels have been left to recover on their own). Because active restoration has been minimal, additional disturbances to recovering systems have the potential to delay or set back the recovery process, particularly in areas where erosive soils are present.

Present Land Disturbances: Present land management activities on NFS lands within the analysis area are listed in Appendix E. As previously noted, management activities on NFS lands are presently governed by the Sierra Nevada Forest Plan Amendment (USDA FS 2004a, 2004b). Therefore, it is assumed that these projects will not adversely affect potential herpetofauna populations or their habitats.

It should be noted that past timber harvest and road building are presently affecting aquatic and riparian systems and will continue to affect them in the future. The extent to which these past activities are and will continue to influence aquatic and riparian systems cannot be quantified on a broad scale. However, at the project-level, these effects are assessed and documented in the Riparian Conservation Objective analysis.

Foreseeable Future Land Disturbances: Foreseeable future land disturbances that have the potential to affect herpetofauna include activities such as fuels reduction projects, timber sales, road building and maintenance, dispersed recreation, and introduction of exotic species.

On NFS lands within the analysis area, foreseeable future land disturbances include 19 fuels reduction projects that will affect approximately 19,211 acres of land; five recreation projects, four of which will affect motor vehicle routes; and four additional projects that include a land exchange (Appendix E). CDF lists a total of 2,752 acres of private land within the ENF administrative boundary for which timber harvest plans have been submitted (Appendix E).

As previously noted, management activities on NFS lands are presently governed by the Sierra Nevada Forest Plan Amendment (USDA FS 2004a, 2004b). Therefore, it is assumed that these projects will not affect herpetofauna populations or their habitats. Timber harvest on private lands is regulated by CDF under the provisions of the California Forest Practice Act and additional rules enacted by the State Board of Forestry and Fire Protection. Streamcourse protections measures afforded under state forest practice rules are generally less restrictive than those governing timber harvests on NFS lands; however, for the purposes of this analysis it is assumed that adverse affects to aquatic habitats will be mitigated.

Other activities such as motor vehicle use and dispersed camping also have the potential to affect aquatic and riparian systems by altering riparian vegetation, increasing in-channel sediment, and altering channel morphology. The magnitude of effects to aquatic systems is frequently tied to the amount of use these areas receive. The degree to which riparian habitat and herpetofauna reproduction would be affected by such disturbance will depend on variables such as route locations relative to streams, soil type, the amount of use, intensity of use, season of use, etc. Scenarios such as high motorized route densities in close proximity to streams on erosive soils that receive high use would be expected to pose the greatest potential for degradation of riparian habitats.

In the future, recreation use on NFS lands and development of lands adjacent to the ENF can be expected to increase the potential for anthropogenic disturbance to riparian and aquatic habitats. As road density adjacent to NFS lands increases, the potential for intentional or unintentional introduction of predatory non-native (exotic) species also increases (Trombulak and Frissell 2000, pg 7). Presently within the analysis area, non-native species that prey on herpetofauna populations include bullfrogs (*Rana catesbeiana*), non-native predatory centrarchid fishes (smallmouth bass [*Micropterus dolomieu*] and bluegill [*Lepomis macrochirus*]), crayfish, and native fish species that have been introduced into waters outside their historic range (e.g. Sierran brook trout introductions).

In the lower elevations in and adjacent to the ENF, introduced bullfrogs pose a serious threat to native herpetofauna species. Within the analysis area, 4,969 bullfrogs in various life stages have been observed. Over 99 percent of these observations have occurred since the year 2000. Although the number of recent bullfrog observations could be attributed to an increase in survey intensity due to hydropower re-licensing requirements, anecdotal information suggests that elevated water temperatures resulting from altered streamflows combined with introductions on privately owned lands in and adjacent to the Forest have expanded the bullfrog's range. For the purposes of this analysis, it is assumed that as development of private lands increases adjacent to NFS lands, the potential for additional bullfrog introductions and range expansion will also increase. However, it should be noted that to some degree in specific river systems such as the South Fork American River, the potential for bullfrogs to expand their range may be off-set by changes in water flows as a result of hydropower re-licensing agreements.

Crayfish, a predator on foothill yellow-legged frog eggmasses (Garcia and Associates 2005), have also been detected in the lower elevations of some riverine systems (e.g., South Fork American River and Sopiago Creek). The range and distribution of crayfish across the analysis area is largely unknown. As such, the extent to which crayfish have, are, and will affect native herpetofauna populations cannot be determined. However, based on the effects of roads on aquatic systems, it would appear that as road density and use increases, the potential for expansion of existing populations and additional introductions will increase.

In the higher elevations, introductions of non-native fish species and the introduction of native fish species into formerly fishless waters[13] has adversely affected native herpetofauna species. Presently, California Department of Fish and Game is assessing native herpetofauna populations and their fish-planting program. It is believed that there will be reductions in fish introductions into areas that are presently sustaining native herpetofauna populations.

Effects Summary

[13] Historically, throughout the Sierra Nevada, more than 99 percent of the lakes and ponds above 6,000 feet in the Sierra Nevada were fishless (Moyle and others 1996).

Based on species-specific natural history characteristics, the primary direct and indirect effects to aquatic and aquatic-dependent species from motor vehicle use are related to increased sediment delivery to stream channels and alteration of riparian vegetation.

Based on the information presented above and the hydrologic assessment (see the Hydrology and Aquatic Resources section of this document), at the forest scale, it does not appear that there would be discernable differences between Alternatives B, Modified B, C, D, and E in terms of their direct and indirect effects on aquatic-species and aquatic-dependent species and their habitats, although there would be a slight reduction in the number and length of streams at a high risk of adverse effects to aquatic habitat when compared to Alternative A.

At the drainage basin scale, for all the action alternatives, fairly minor differences in the reduction in the length of streams at a high risk of adverse effects to aquatic habitat would be realized.

At the stream system scale, all of the action alternatives would result in a discernable decline in the number of streams at a high risk of adverse effects from unpaved roads in the following systems: Silver Fork American River, Alder Creek, Camp Creek, and the North Fork Cosumnes River. The greatest reduction in risk would occur under Alternative E, followed by Modified B.

At the stream system scale, under all of the action alternatives a slight decline in the number of streams at a high risk of adverse effects from unpaved roads would be realized in the following stream systems: Silver Creek, Slab Creek Reservoir, Steely Fork Cosumnes River, Dogtown Creek, and the Middle Fork Cosumnes River.

The development criteria for Modified B should reduce the risk of adverse effects on aquatic habitats from unpaved roads in localized areas where species of interest have been detected (see the description of Modified B in Chapter 2).

The risk of cumulative watershed effects at the 7^{th} field watershed is not affected by any of the alternatives in the Public Motor Vehicle Travel Management Environmental Impact Statement (see the Hydrology and Aquatic Resources section of this document for additional information). However, as noted above, the reductions in direct and indirect effects to aquatic habitats vary by alternative; implementation of any of the action alternatives would be expected to carry these direct and indirect effects forward through time. Combined with the foreseeable future land disturbances noted above, from a cumulative effects standpoint, the extent to which aquatic habitats may be most altered would tend to be dependent on the following:

- shifts in OHV and recreational use patterns,
- development of private lands adjacent to the forest boundary, and
- increases in recreational use of National Forest System lands.

Conclusions

- At the *forest-wide scale*, Alternative A would be expected to have the greatest potential to adversely affect aquatic habitats and aquatic-species and aquatic-dependent species because Alternative A proposes the greatest overall length of motorized route, the greatest amount of unauthorized route designation, and has the most route length within Riparian Conservation Areas.
- At the *forest-wide scale*, Alternative B would be expected to have the greatest potential to adversely affect aquatic habitats and aquatic-species and aquatic-dependent species of the action alternatives. The reasons for this are as follows:

- Alternative B proposes the second greatest amount of unauthorized route for designation; the route length proposed for designation in this alternative is double that of Alternatives C or D.
- Alternative B proposes to convert the greatest length of current NFS non-motorized trails for motorized use, roughly 6 times more than Alternatives Modified B or D and 8 times that proposed for designation in Alternative E.
- Alternative B would designate the greatest length of ML 1 and 2 motorized routes within meadows.
- Based on the length of motorized route within Riparian Conservation Areas of perennial streams, intermittent streams, and meadows[14], at the *forest-wide scale*, the greatest reduction in risk of adverse aquatic habitat alteration would occur with implementation of Modified B followed by Alternative E.
- At the *stream system scale*, in the Alder Creek, Camp Creek, North Fork Cosumnes River and Silver Fork American River stream systems, the greatest reduction in risk of adverse aquatic habitat alteration would occur under Alternative E followed by Modified B. Of these stream systems, the North Fork Cosumnes River system would realize the greatest overall reduction in risk.
- At the *forest scale*, meadow systems would benefit most under Alternative E because no motorized routes would bisect meadows. Alternative Modified B proposes the second least amount of motorized route through meadows systems. Alternative B, because it proposes the greatest length of route through meadows, has the greatest potential to adversely affect meadow systems; the risk to meadow systems under Alternative B is followed by Alternatives D and C respectively.
- At the *forest scale*, the risk of unintentional introductions of chemical pollutants at stream crossings would be lowest in Alternative E, followed by Alternative Modified B. Of the action alternatives, the highest potential for unintentional introductions of chemical pollutants at stream crossings would be realized under Alternative B, followed by D and C respectively.

Individual Species

California Red-legged Frog

The California red-legged frog is a federally listed Threatened Species that can be found in both lentic and lotic systems. This species frequents undisturbed low-gradient streams and creeks, but can also be found in ponds, marshes, seeps, springs, and moist intermittent drainages. Immature California red-legged frogs are mainly herbivores, foraging on algae, plant tissue, and organic debris (NatureServe 2006a). The diet of adult frogs includes aquatic macroinvertebrates, as well as terrestrial invertebrates (NatureServe 2006).

The USFWS (2006a) has identified four Primary Constituent Elements[15] required for self-sustaining California red-legged frog populations. They are aquatic breeding habitat, non-breeding aquatic habitat, upland habitat, and dispersal habitat. Aquatic breeding habitats are standing bodies of fresh water including ponds, slow moving streams or pools within streams, and other ephemeral or permanent water bodies that typically become inundated during winter rains (USFWS 2006a).

[14] Excludes Riparian Conservation Areas of ephemeral streams.
[15] The verbiage presented here is taken from US Fish and Wildlife Service notice published April 13, 2006 in Federal Register; Vol. 71, No. 71.

GIS analysis of potential California red-legged frog breeding habitat within the ENF indicates that there 150.3 miles of low-gradient perennial stream and 52 waterbodies less than 50 acres in size.

Non-breeding aquatic habitats consist of the fresh water habitats described above, that may or may not hold water long enough for the subspecies to hatch and complete its aquatic life cycle, but that do provide for shelter, foraging, predator avoidance, and aquatic dispersal for juvenile and adult California red-legged frogs (USFWS 2006a). Non-breeding habitats are comprised of the 150.3 miles of low-gradient perennial stream and 12.8 miles of low-gradient seasonal stream adjacent to the low-gradient perennial reaches.

Upland habitats are areas within 200 feet of the edge of the riparian vegetation or dripline surrounding aquatic and riparian habitat and comprised of various vegetational series such as grasslands, woodlands, and/or wetland/riparian plant species that provides the frog shelter, forage, and predator avoidance (USFWS 2006a). Upland habitat can include structural features such as boulders, rocks, and organic debris (e.g. downed trees, logs), as well as small mammal burrows and moist leaf litter.

On the ENF, there are has been 20 detections[16] of the California red-legged frog in and adjacent to forest lands since 1974. The only waterbody considered to sustain a population of California red-legged frogs is North Fork Weber Creek. The majority of detections along this creek occur in Spivey Pond[17,18].

Risk Factors

Various studies have demonstrated that roads can adversely affect watershed processes by increasing discharge rates and altering the frequency and magnitude of peak runoff discharges (Elliott 2000); however, Markman (2008) indicates that this is not likely to have occurred on the ENF. Roads also have the potential to deliver sediment and other contaminants to streams. Throughout the western United States, roads are considered the principal cause of accelerated erosion in forested environments (Harr and Nichols 1993 as reported in Kattleman 1996; McCashion and Rice 1983). Suspended sediment, particularly suspended sediment from surface erosion, has the potential to transport chemical pollutants into stream systems (Elliott 2000).

An increase in sediment delivery has the potential to cover California red-legged frog eggmasses, change pool depth, and alter general channel morphology, thus adversely affecting habitat and potentially disrupting amphibian reproduction. Effects of elevated sediment delivery to aquatic systems include adverse effects to water quality (e.g. increases in turbidity) and changes in substrate composition that potentially could influence in-stream primary production and

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[16] Detections may include more than one individual and/or more than one life stage.

[17] For the purposes of this analysis, an occupied site is considered to be a waterbody where one or more life stages of the California red-legged frog have been detected within the last 5 years. If a detection has been recorded in a waterbody more than 5 years ago, and follow-up surveys have failed to detect one or more life stages of the California red-legged frog, the site was considered unoccupied. If a detection has been recorded in a waterbody more than 5 years ago, and there have been no follow-up surveys, the site was considered occupied if the waterbody had the potential to be affected by this project.

[18] In July 2004, a management plan for the California red-legged frog was approved and signed by the USDI Fish and Wildlife Service, the Bureau of Land Management, the Bureau of Reclamation, the California Department of Fish and Game, El Dorado County, the El Dorado Irrigation District, the American River Conservancy, and the Eldorado National Forest. The Spivey Pond California red-legged frog Management Area is 54 acres in size.

macroinvertebrate assemblages. Such changes could alter the prey presence/absence and/or promote changes in habitat that favor non-native species such as bullfrogs and centrarchids that have a negative effect on the California red-legged frog. General roads impacts are summarized in the direct effects to all species section.

Direct and Indirect Effects for All Alternatives – California Red-legged Frog

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measure 5: Route locations and area locations[19] of specific concern for the California red-legged frog are[20]:

- Routes or areas that have the potential to capture surface flow and then deliver sediment into a stream associated[21] with California red-legged frog;
- Routes located in RCAs that contain suitable California red-legged frog habitat.
- Crossing approaches get the riders in and out of the stream channel and riparian area in the shortest distance possible while meeting the gradient and approach length standards.
- Routes or areas that cross any stream or waterbody within 500 feet of known occupied sites[22] of California red-legged frog, and routes or areas within a distance of 500 feet from wetlands (i.e. springs, wet meadows, ponds, marshes).
- In habitat occupied by California red-legged frog, routes or areas that have the potential to capture or divert stream flow. Approaches to stream crossings need to be downsloped toward the stream on both sides.
- In California red-legged frog habitat, areas that are located inside of Riparian Reserve, Riparian Conservation Areas, meadows, and wetlands within California red-legged frog habitat.

Routes or areas within Critical Aquatic Refuges for the California red-legged frog.

Item a, c, and e: Alternative A is the only Alternative that has routes in the North Fork Weber Creek drainage, which is the only aquatic system occupied with red-legged frogs within the analysis area. Therefore, it is the only Alternative that has the potential to capture surface flow and then deliver sediment into a stream associated[23] with California red-legged frog. Similarly, it is the only Alternative with a route open for public wheeled motor vehicle use that would cross a stream occupied by this species. None of the routes in Alternative A cross any stream or waterbody within 500 feet of known sites occupied by the California red-legged frog, reducing the potential of this alternative to adversely affect this species.

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[19] "Area" as defined by the US Fish and Wildlife Service is a wheeled motorized vehicle use area. A "Route" is defined as a wheeled motorized vehicle road or trail.
[20] As identified by the US Fish and Wildlife Service.
[21] Assumed to be occupied.
[22] For the purposes of this analysis, an occupied site is a waterbody where one or more life stages of the California red-legged frog have been detected within the last 5 years. If a detection has been recorded in a waterbody more than 5 years ago, and follow-up surveys have failed to detect one or more life stages of the California red-legged frog, the site was considered unoccupied. If a detection has been recorded in a waterbody more than 5 years ago, and there have been no follow-up surveys, the site was considered occupied.
[23] Assumed to be occupied.

Item b: Alternative A is also the only alternative with routes open for public wheeled motor vehicle use within the Riparian Conservation Area of a stream occupied by the California red-legged frog. Although there are no routes or areas within Critical Aquatic Refuges for the California red-legged frog, Critical Habitat Unit ELD-1[24] is immediately adjacent to the Forest boundary. Direct and indirect effects to this Critical Habitat Unit would be dependent on the amount and type of use the motorized routes would receive. Presently, use is relatively light.

Within Riparian Conservation Areas, four segments of unauthorized route would be open for public wheeled motor vehicle use under all the action alternatives. Two of the routes are located adjacent to the North Fork Cosumnes; one route is located within the Riparian Conservation Area of the Rubicon River; and, one route is located adjacent to the South Fork Silver Creek.

The proposed routes in the RCA of the North Fork Cosumnes River are upstream of previously surveyed reaches. However, similar to the surveyed reaches, the river adjacent to the proposed route is generally lacking in deep slow-moving pools, is subject to high flushing flows, and supports a naturally reproducing brown trout and rainbow trout fishery. Water velocities in the North Fork Cosumnes River adjacent to the proposed route tend to vary greatly in response to precipitation events. Additionally, recreationists have erected rock dams that further alter natural flow regimes. As evidenced by the crossing at 9N30, water velocities during spring run-off periods are too high during the spring breeding period to allow for successful breeding of California red-legged frogs.

The other routes are adjacent to South Fork Silver Creek and the Rubicon River; surveys were conducted along these streams during hydroelectric re-licensing processes. These surveys determined that neither of these streams provided suitable California red-legged frog habitat.

Item d: Alternatives B, Modified B, C, D, and E, while not having the potential to affect aquatic systems known to be occupied by the California red-legged frog, could affect breeding habitats, non-breeding aquatic habitats, upland habitats, and dispersal habitats utilized by this species. Issues of specific concern would be unauthorized routes proposed for designation in the action alternatives that are within 500 feet of wetlands and areas that are located inside of Riparian Reserve, Riparian Conservation Areas, meadows, and wetlands within California red-legged frog r07 -1.cut3s51 -rt3s6

Alternatives B, Modified B, C, D, and E would also have the potential to aquatic habitats as described above in Effects Common to All Species.

Foothill Yellow-legged Frog

The foothill yellow-legged frog, a USDA Forest Service Sensitive Species, was common in the Sierra Nevada historically being found in most every Sierran creek below 6,000 feet in elevation. However, this species has apparently disappeared from 66 percent of its historic range (Jennings 1996). The reduction in the range of the foothill yellow-legged frog is generally attributed to aquatic and riparian habitat alterations and changes in stream hydrology.

Foothill yellow-legged frogs are found primarily in sunny areas along streams and rivers with a rocky substrate; they are generally found within 33 feet of water, although they have been observed more than 164 feet from water. The timing and breeding of this species varies across its range. However, breeding occurs almost exclusively in streams and rivers where cobble-sized and larger rocks serve as sites for egg-laying (AmphibiaWeb 2007).

On the ENF, potential habitat for foothill yellow-legged frogs is considered to be all perennial streams and intermittent streams with persistent pools below 6,000 feet in elevation. This includes approximately 843.7 miles of perennial stream.

Risk Factors

Risk factors from implementation of any of the alternatives for foothill yellow-legged frogs are essentially the same as those for the California red-legged frog because the elevational constraints are essentially the same. Like the California red-legged frog, foothill yellow-legged frog populations are often found in streams adjacent to privately owned lands. As such, this species also has a high potential to be affected by introduced non-native (exotic) species. Presently within the analysis area, non-native species that prey on herpetofauna populations include bullfrogs (*Rana catesbeiana*), non-native predatory centrarchid fishes (smallmouth bass [*Micropterus dolomieu*] and bluegill [*Lepomis macrochirus*]), and crayfish[25].

Roads in close proximity to streams also increase the potential for disturbance of aquatic species and their habitats. In general, such disturbance would be correlated to the type of disturbance (e.g. magnitude of increase in edge effect, roadside hazard tree removal, collection of aquatic species, behavioral changes in response to noise, etc.), the intensity of that disturbance, and the distance of the road from the stream.

[25] Bullfrogs have been detected in the South Fork American River and other waterbodies across the Forest and on adjacent private lands. They are a suspected predator of foothill yellow-legged frogs. Crayfish, a known predator of foothill yellow-legged frog eggmasses (Garcia and Associates 2005), have been detected in the lower elevations of some lotic systems (e.g. South Fork American River and Sopiago Creek). The range and distribution of crayfish across the analysis area is largely unknown.

Direct and Indirect Effects for All Alternatives – Foothill Yellow-legged Frog

Indicator Measures 1-4: Same as the discussion above related to direct and indirect effects common to all species.

Indicator Measure 6: On the ENF, the majority of foothill yellow-legged frog detections have been confined larger streams and rivers (e.g., Camp Creek, North Fork Mokelumne River [below Salt Springs Reservoir], Rubicon River [below Hell Hole Reservoir], and South Fork American River). Because of the volume of water in these channels and the topography adjacent to the channels, motorized routes and route stream crossings tend to be improved and associated with ML-3, 4, or 5 roads, minimizing adverse affects to stream channels and potential foothill yellow-legged frog habitats[26]. Additionally, because of the volume of water moving through these drainages, sediment tends to move through system faster than in smaller streams thereby minimizing localized adverse affects to aquatic habitats.

Under Alternative A there are some system routes or route segments proposed for motorized use adjacent to these channels and/or larger tributaries of these channels are not designated in the action alternatives (e.g., 9N93A, 10N54C, 10N55B, 10N64A, 10N80, 10N89, 11N66, and the lower end of 14N25G).

In terms of unauthorized routes, as previously noted, studies have shown that anthropogenic disturbances that are within one site-potential tree height of streams have an elevated potential to adversely affect aquatic habitats. Since 200 feet approximates one site-potential tree height across the forest, a GIS query was conducted to determine the number of unauthorized roads and trails within 200 feet of perennial stream channels within the elevational constraints of the foothill yellow-legged frog. Using this criterion, 26 perennial stream/stream segments were identified as having the potential to be adversely affected by route designation under Alternative B. Alternatives Modified B and E each had the potential to adversely 10 affect perennial stream/stream segments whereas Alternatives C and D had the potential to adversely affect 19 and 24 perennial stream/stream segments respectively (see Project Aquatic Species Biological Evaluation for additional information).

Indicator Measures 7-11: These measures do not apply to Foothill Yellow-legged Frog

Cumulative Effects – Foothill Yellow-legged Frog

Same as the discussion above regarding Effects Common to All Species.

Mountain Yellow-legged Frog

In the Sierra Nevada, the mountain yellow-legged frog, a USDA Forest Service Sensitive Species and Candidate Species for federal listing, is found from approximately 5,000 feet to over 12,000 feet in elevation. The historic range of this species extends from Plumas County to Tulare County (Jennings and Hayes 1994); however, it has disappeared from 70-90 percent of its historic range in the Sierra Nevada (USFWS 2000). This frog is seldom far from water and prefers well illuminated, sloping banks of meadow streams, riverbanks, isolated pools, and lake borders with vegetation that is continuous to the water's edge (Zeiner and others 1988). Mountain yellow-legged frogs have also been observed using a variety of habitats, including grassy streambanks, large boulders adjacent to deep stream pools, fallen trees extending into lakes, and along rocky lake shorelines adjacent to deeper water (Elliott pers. comm. 2000). Shallows along stream and

[26] Maintenance Level 3, 4, and 5 roads are outside the scope of this analysis.

lake margins are used by tadpoles to absorb heat to enhance metabolic rate (Jennings and Hayes 1994).

In the Sierra Nevada, mountain yellow-legged frogs generally breed from early spring through mid-summer, depending on when suitable breeding habitats (ponds, lakes, and streams) are ice-free (AmphibiaWeb 2007). Unlike the foothill yellow-legged frog, mountain yellow-legged frog tadpoles take two or more years to metamorphose, generally overwintering in deeper water. Therefore, first and second year tadpoles may be found in the same waterbody.

Approximately 616.96 miles of perennial streams are located on the ENF above 5,000 feet in elevation. Approximately 939 waterbodies less than 50 acres in size are located on NFS lands above this elevation. All of these aquatic features are considered potential habitat.

Risk Factors

Risk factors from implementation of any of the alternatives are generally associated with an increase in sediment delivery to stream channels. An increase in sediment delivery has the potential to cover eggmasses, change pool depth, and alter general channel morphology, thus adversely affecting habitat and potentially disrupting amphibian reproduction.

Additionally, increases in sediment delivery to aquatic systems could result in changes to substrate composition and stream morphology that potentially could influence in-stream primary production, macroinvertebrate assemblages, and predator/prey relationships. Since the mountain yellow-legged frog tadpoles take two or more years to metamorphose, seasonal changes in aquatic conditions (e.g. decreases on pool depth) resulting from increased sediment delivery to aquatic systems has a higher potential to affect this species.

Direct and Indirect Effects for All Alternatives – Mountain Yellow-legged Frog

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measures 5-6 and 8-11: These measures do not apply to mountain yellow legged frog.

Indicator Measure 7: The greatest reduction in unauthorized routes within one-site potential tree height of perennial streams designated for public motorized use would be realized under Alternatives Modified B and E followed by Alternative C; Alternatives B and D have similar numbers of unauthorized route designations.

In terms of perennial stream crossings, Alternative E had the lowest number of unpaved roads crossing perennial streams above 5,000 feet (n=34), followed by Modified B (n=84). Alternative A has 183 roads crossing perennial streams above 5,000 feet, roughly 5 times the number of Alternative E and twice that of Modified B. Alternative D has proposed 104, while Alternatives B and C have 116, and 98 crossings respectively (see Project Aquatic Species Biological Evaluation for additional information).

To assess the potential effects of unauthorized route designation, a GIS query was conducted to determine the number of unauthorized roads and trails within one site-potential tree height[27] of perennial stream channels within the elevational constraints of the mountain yellow-legged frog. Using this criterion, 31 perennial stream/stream segments were identified as having the potential to be adversely affected by route designation under Alternative B. Alternatives E and Modified B had the potential to adversely affect nine and perennial stream/stream segments respectively;

[27] One site-potential tree height was assumed to approximate 60 m (200 feet.

whereas Alternatives C and D had the potential to adversely affect 20 and 30 perennial stream/stream segments respectively (see Project Aquatic Species Biological Evaluation for additional information).

Specific to this species, two of the six alternatives propose to authorize motorized routes within the Little Indian Valley Critical Aquatic Refuge (Table 3J.1). Alternative A would allow travel by all vehicles on approximately 1.5 miles of road. Alternative B would allow motor vehicle travel on approximately 0.6 miles of road; Modified B, C, D, and E would not authorize motorized use on any routes within the CAR. Thus, Alternatives Modified B, C, D, and E would be both consistent with the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement Record of Decision and afford greater protection to this species.

Table 3-J.1: Routes within the Little Indian Valley Critical Aquatic Refuge by Alternative

Route and Route Length (feet)		Alternative					
		A	B	Mod. B	C	D	E
NSRALP114	1,263	Highway and Non-Highway Vehicles	ML2: High Clearance	Closed	Closed	Closed	Closed
NSRALP114A	1,926	Highway and Non-Highway Vehicles	ML2: High Clearance	Closed	Closed	Closed	Closed
NSRALP114AB	1,093	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed
NSRALP114 AC	1,099	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed
NSRALP114 B	1,427	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed
NSRALP114 BA	213	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed
Unnamed route	121	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed
Unnamed route	761	Highway and Non-Highway Vehicles	Closed	Closed	Closed	Closed	Closed

For additional information, see the discussion above regarding Effects Common to All Species.

Cumulative Effects – Mountain Yellow-legged Frog

See the discussion above regarding Effects Common to All Species.

Yosemite Toad

The Yosemite toad, a USDA Forest Service Sensitive Species and Candidate Species for federal listing, inhabits high elevation wetland areas and meadows from Highway 88 in Alpine County south to Kaiser Pass in the Evolution Lake/Darwin Canyon area of Fresno County. The historic elevational range of Yosemite toads is 4,790 to 11,910 feet. “Yosemite toads are most likely to be found in areas with thick meadow vegetation or patches of low willows near or in water, and use rodent burrows for overwintering and temporary refuge during the summer. Breeding habitat includes the edges of wet meadows, slow flowing streams, shallow ponds and shallow areas of lakes (USFWS 2006b)."

Risk Factors

Risk factors from implementation of any of the alternatives are generally associated with inclusion of motorized routes that would have the potential to:

Crush individuals;

Destroy rodent burrows used for cover and hibernation sites;

Degrade upland areas used as non-breeding habitat;

Alter terrestrial environments creating barriers to dispersal;

Fragment habitat;

Increase individual disturbance (e.g., individual collection, mortality due to encounters with domestic pets such as dogs, etc.)

Direct and Indirect Effects for All Alternatives – Yosemite Toad

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measures 5-7 and 9-11: These measures do not apply to Yosemite toads.

- ***Indicator Measure 8:*** "Threats facing the Yosemite toad include cattle grazing, timber harvesting, recreation, disease, and climate change (USFWS 2006b)." Such disturbances have the potential to degrade or destroy upland areas used as non-breeding habitat, collapse rodent burrows used for cover and hibernation sites, and alter the terrestrial environment creating barriers to dispersal and fragmentation of habitat.

On a local scale, motorized routes can affect habitat and trampling of occupied rodent burrows and crushing of individuals by vehicles can contribute to individual mortality.

Within the analysis area for the Yosemite toad, there are several system routes or portions thereof that are proposed for designation under one or more of the action alternatives. These routes include segments of 9N01, 9N03, and 9N83. System route, 9N01 is located west of Lower Blue Lake. Between 1992 and 2003 approximately 513 Yosemite toads and/or Yosemite toad hybrids in various life stages have been detected less than 3 feet from this road. 9N01 is designated for public motorized vehicle use in all of the action alternatives; however, a reduction in route length of approximately 33 percent is realized under Alternative E.

Route 9N03 bisects two fingers of Indian Valley meadow in northern portion of the meadow. Herpetofauna visual encounter surveys conducted in the Indian Valley area during 2006 and 2007 failed to detect any Yosemite toads. However, since the target species for these surveys was mountain yellow-legged frogs, the surveys were conducted later in the year. As such, the probability of detection for Yosemite toads was reduced. Route 9N03 is proposed to be designated for public motor use in Alternatives A, B, C and D; it is not designated under Alternatives Modified B and E.

Route 9N83 crosses Blue Creek downstream of where Yosemite toads/hybrids have been detected at two separate locations along Blue Creek between 2001 and 2003. Additionally, 9N83 crosses a seasonal stream and two perennial streams, Deer Creek, an unnamed tributary to Deer Creek, and one unnamed meadow. All of the alternatives would designate portions of this route for motor vehicle use; however, the length of route proposed under Alternative E is substantially shorter and does not include any perennial or seasonal stream crossings. Thus, to some degree, all alternatives would have the potential to adversely affect this species except Alternative E.

For additional information regarding potential habitat alteration, see discussion above regarding Direct and Indirect Effects Common to All Species.

Cumulative Effects – Yosemite Toad

See the discussion above regarding Effects Common to All Species.

Western Pond Turtle

Western pond turtles, a USDA Forest Service Sensitive Species, are habitat generalists, occurring in a wide variety of permanent and intermittent aquatic habitats below 5,000 feet in elevation. Most populations currently exist in smaller streams, usually in montane environs.

Within the analysis area, there are approximately 150.3 miles of low-gradient streams (less than or equal to 2 percent). These lower gradient stream reaches would have a higher probability of providing suitable habitat for the western pond turtle than higher gradient stream reaches. A GIS analysis[28] indicates that approximately 25,544 acres of nesting and overwintering habitat for western pond turtles exists in or immediately adj

Table 3-J.2: Seasonal movements of western pond turtles and potential disturbance

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Disturbance to:												
Nesting females												
Eggs/ hatchlings												
Overwintering individuals												

Western pond turtle also move into upland slopes while overwintering. Overwintering movements are poorly understood; however, in Trinity County California, western pond turtles left the study-area river in September and began return movements in February, ending in June (Table 3-J.2). The only lull in activity occurred between December and January (Reese and Welsh 1997). In one study in Trinity County, California, the average distance of overwintering sites from a watercourse was 550 feet (Ashton and other 1997). In the Sierra Nevada, the most likely time for western pond turtle overwintering movements is during the fall/late fall and early spring, and would represent movements to and from upland overwintering sites. Thus, because of their dependence on terrestrial habitats and their movements to and from these habitats, there is a risk for disturbance to western pond turtles or their nests essentially year-round.

Risk Factors

Western pond turtle behavior can be altered by motor vehicle traffic (Ashton and others 1997). Additionally, motor vehicle traffic can contribute to mortality. Western pond turtles moving back and forth from aquatic to terrestrial habitats are susceptible to crushing by vehicles. Routes that parallel aquatic habitats appear to present more of a threat from crushing than stream crossings; however, channel crossings can potentially alter aquatic habitats by delivering sediments and other contaminants to aquatic systems.

Direct and Indirect Effects – Western Pond Turtle

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measures 5-8 and 11: These measures do not apply to western pond turtle.

Indicator Measure 9: Based on the natural history of this species, to varying degrees, all of the action alternatives have the potential to adversely affect individual western pond turtles. The potential effects to this species' terrestrial habitats and terrestrial movements were assessed by analyzing the length of designated route in western pond turtle habit Figure 3-J.6; the number of stream crossings by channel type within the elevational constraint of the species Figure 3-J.7; and, the potential for unauthorized routes within one site-potential tree height of perennial streams to affect riparian condition Figure 3-J.5 (above).

Figure 3-J.6: Length of motorized route proposed for designation in western pond turtle habitat by Alternative

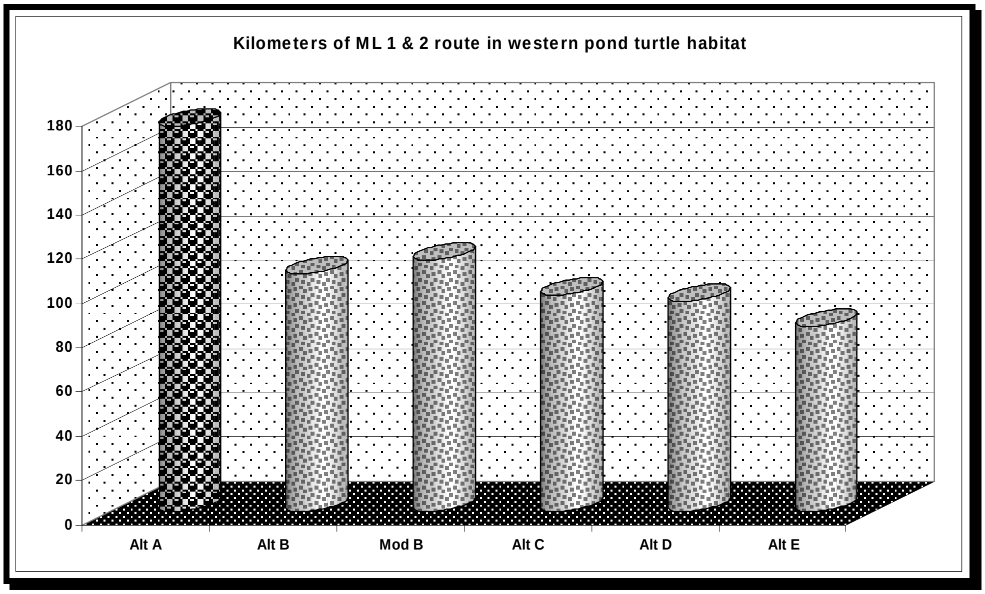
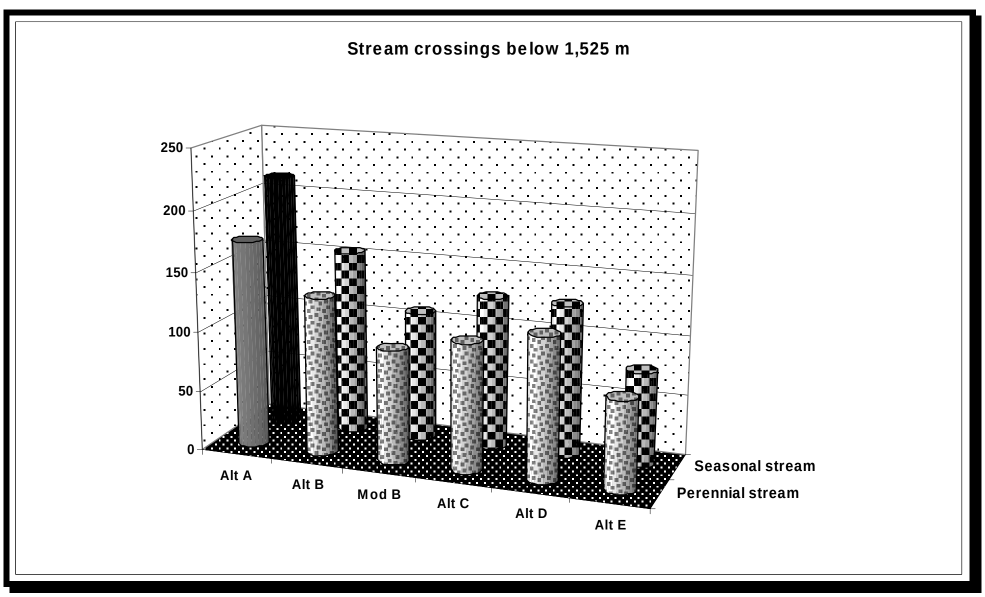


Figure 3-J.7: Number of stream crossings below 5,000 feet in elevation by channel type and alternative



As noted above, western pond turtles frequent terrestrial habitats. Therefore, an analysis of proposed routes in western pond turtle habitat by alternative was conducted. This analysis indicated that of all the action alternatives Alternative E proposed the least amount of motorized route for public use while Alternative Modified B proposed the greatest length (Figure 3-J.6).

To assess the potential for individual mortality due to crushing by vehicles as well as to assess the potential deliver sediment and chemical contaminants to streams at road crossings, a GIS query was conducted to determine the number of perennial stream crossings within the elevational constraint of the western pond turtle. As indicated in Figure 3-J.7, Alternative E proposes the fewest number of perennial stream crossings within the elevational constraint of this species followed by Alternative Modified B. Of the other action alternatives, Alternative B has the greatest number of stream crossings below 5,000 feet followed in decreasing order by Alternatives D and C.

To further assess the potential of route designation on the western pond turtles and their terrestrial and aquatic habitats, a GIS query was conducted to determine the number of unauthorized roads and trails within one site-potential tree height of perennial stream channels within the elevational constraints of this species. Using this criterion, 10 perennial stream/stream segments were identified as having the potential to be adversely affected by route designation under Alternative B. Alternatives E and Modified B each had the potential to adversely affect 4 perennial stream/stream segments respectively, whereas Alternatives C and D had the potential to adversely affect 7 and 8 perennial stream/stream segments respectively (see Project Aquatic Species Biological Evaluation for additional information).

Based on the analysis of the criteria above, the greatest benefit to the western pond turtle would be realized under Alternative E. And although Alternative Modified B proposes the greatest length of motorized route in western pond turtle habitat, it also proposes the fewest number of stream crossings and designates the fewest number of unauthorized routes within this species elevational constraint.

For additional information on the potential for habitat disturbance and alteration for this species, including aquatic habitats, see the discussion above regarding Effects Common to All Species.

Cumulative Effects – Western Pond Turtle

Based on historic accounts, it appears that one of the major causes in the decline of western pond turtle populations was extensive commercial harvest of the species as a food source. From approximately the 1870s to the 1930s, western pond turtles were harvested commercially; millions were sold in San Francisco markets for human consumption (Ashton and others 1997). Although there has been a ban on the sale and/or exhibition of native reptiles and amphibians since the 1980s, illegal collection of turtles has occurred (Ashton and others 1997). The extent to which these activities have affected western pond turtle populations in the analysis area is unknown.

As previously noted, western pond turtles can be found over 400 yards from streams, far exceeding traditionally protected buffer zones afforded under the provisions of the California Forest Practice Act (and additional rules enacted by the State Board of Forestry and Fire Protection) or the Riparian Conservation Area widths established under the Record of Decision for the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (USDA FS 2004b). Thus, because western pond turtles travel into upland environs frequently and often for prolonged periods of time, they are more susceptible than other herpetofauna to ground disturbing activities and vehicle traffic mortality. As suggested in recent studies, as road densities increase, the potential for individual western pond turtle mortality due to crushing by vehicles also increases, particularly in those areas where roads paralleled streams (Ashton and others 1997). Crushing of individual western pond turtles by vehicles is suspected of contributing significantly to mortality (Ashton and others 1997, Gibbs and Shriver 2002).

Based on the natural history of this species, perhaps the greatest threat to both individuals and populations presently occupying aquatic habitats within the ENF is the increase recreational use and potential introduction of non-native species associated with the increasing development of private lands adjacent to the Forest.

Hardhead

Historically, hardhead, a USDA Forest Service Sensitive Species, have been regarded as a widespread and locally abundant species (Moyle 2002). Across its range, most streams where hardhead have been observed are below 5,000 feett in elevation and have summer temperatures above 68^{O}F; they generally select the warmest available water within the stream (Moyle 2002). Hardhead require clear, cool water in deep pools to survive and reproduce.

Hardhead are primarily bottom feeders, foraging for invertebrates and aquatic plant material at the bottom of bodies of quiet water. They will occasionally feed on plankton and surface insects. Smaller hardhead (less than 8 inches) feed primarily on mayfly nymphs, caddisfly larvae, and small snails, whereas larger fish feed mainly on aquatic plants (including filamentous algae), as well as crayfish and other large invertebrates (Moyle 2002).

Hardhead population declines and extirpations have been attributed to habitat alterations (e.g. reservoir and dam construction), habitat fragmentation, and introductions of predatory fish such as smallmouth bass (*Micropterus dolomieu*) (Moyle 2002).

Hardhead are known to occur in Middle Fork American River below Ralston Afterbay and is suspected to occur in the lower reaches of the Rubicon River (CDFG 1979). This species has also been observed in the South Fork American River below Silver Creek (FERC 2003).

Risk Factors

The main risk to hardhead populations from implementation of any of the Alternatives is associated with sediment delivery to stream channels. As previously noted, an increase in sediment delivery has the potential to change pool depth, alter general channel morphology, and adversely affect water quality (e.g. increases in turbidity), potentially influencing in-stream primary production, macroinvertebrate assemblages, and increasing the potential for habitat changes that favor non-native predator species.

Direct and Indirect Effects for All Alternatives - Hardhead

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measures 5-9 and 11: These measures do not apply to hardhead.

Indicator Measure 10: As noted in the Hydrology and Aquatic Resources section, there are four streams that have a considerable reduction in numbers and length of streams at high risk to adverse effects to aquatic habitats under all or most of the alternatives. Two of these four streams, Silver Fork American River and Alder Creek, are tributaries of the South Fork American River, thus, indicating a potential decrease in erosion and in-channel sedimentation in the main stem.

It should be noted that dams on the South Fork American River and its tributaries would hold sediment originating from watersheds above the impoundment, reducing the amount of sediment that actually reaches hardhead populations. Similarly, the dam at Hell Hole Reservoir would reduce the amount of sediment delivery to the Rubicon River.

For additional information regarding potential affects to this species, see discussion above regarding Effects Common to All Species.

Cumulative Effects Unique to This Species

See the discussion above regarding Effects Common to All Species.

Trout

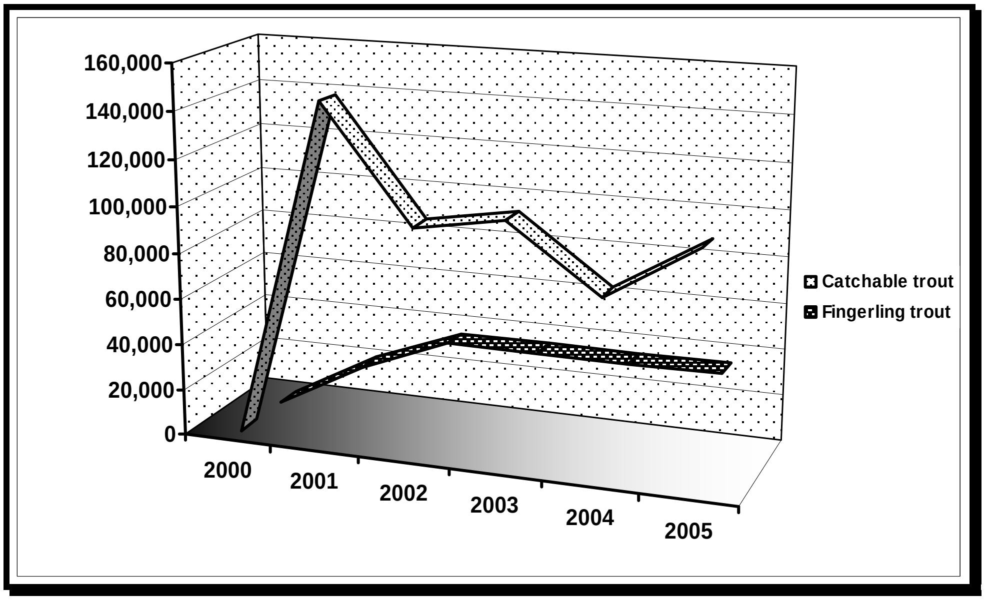
Trout are a USDA Forest Service Management Indicator Species for the Eldorado National Forest[31]. Presently on the Eldorado National Forest, rainbow trout (*Oncorhynchus mykiss*) are known to occupy 361.5 miles of stream and are suspected to be present in 162.1 miles of stream. Brown trout (*Salmo trutta*) are known to occupy 266.66 miles of stream and are suspected to be present in an additional 174.5 miles of stream, and brook trout (*Savelinus fontinalis*) are known to occupy 54.97 miles of stream and are suspected to be present in an additional 35.27 miles of stream.

Rainbow trout are native to Pacific slope drainages from Alaska to Baja, California and have been introduced in numerous areas since the late 1800's (USDA FS 2007). By contrast, brown trout which are native to Europe, North Africa, and western Asia, were first introduced into North America in the late 1800s and since that time, have been reared in California hatcheries and planted throughout the state (USDA FS 2007). Similarly, brook trout, which are native to the eastern United States, have been widely introduced throughout the western United States (USDA FS 2007).

A review of Eldorado National Forest fisheries records indicates that between 2001 and 2005, the California Department of Fish and Game planted approximately 684,190 rainbow trout, brown trout, and brook trout in waters in and immediately adjacent to the forest (Figure 3-J.8).

[31] Forest-scale Management Indicator Species habitat and population monitoring for the trout species are summarized in the project Aquatic Management Indicator Species Report and the Eldorado Forest Management Indicator Species Report (see the Project Record for additional information).

Figure 3-J.8: Number of trout species planted by California Department of Fish and Game in waters in and immediately adjacent to the Eldorado National Forest between 2001 and 2005



Risk Factors

To varying degrees across the Sierra Nevada, anthropogenic disturbances such as mining, logging, road building, and grazing have and are affecting rainbow trout populations. Of primary concern is the delivery of fine-grained sediment to stream channels, which has the potential to change pool depth, alter general channel morphology, degrade spawning habitat, and adversely affect water quality (e.g. increase turbidity). Each of these changes could in turn could alter in-stream primary production, macroinvertebrate assemblages, and increase the potential for habitat changes that favor non-native species.

Direct and Indirect Effects for All Alternatives - Trout

Indicator Measures 1-4: See the discussion above related to direct and indirect effects common to all species.

Indicator Measures 5-10: These measures do not apply to trout.

Indicator Measure 11: The Eldorado National Forest Management Indicator Species Report indicates the amount of rainbow trout, brown trout, and brook trout habitat across the forest is stable. On a forest-wide scale, implementation of any of the action alternatives could affect habitat quality but would not be expected to measurably influence trout habitat trends. Potential changes in habitat quality are described in the discussion for Indicator Measures 1-4 in the section *Effects Common to All Species* and the project *Management Indicator Species Report.*

Cumulative Effects Unique to This Species

See the discussion above regarding Effects Common to All Species.

K. Facilities

Affected Environment

Facilities play a major support role in the management and use of ENF resources. Facilities include administrative structures and facilities, transportation facilities, and recreation and public service facilities. The transportation facilities are the principle facilities involved in this project.

NFS Roads

There are 2,949 miles of NFS roads in the forest transportation system (based on the snapshot of the transportation system taken in February 2006, including County Roads and State Highways). The system is serviced mainly by two trans-Sierra highways (50 and 88), which traverse the Forest linking the Sacramento Valley and western Nevada. There are approximately 334 miles of road under county or state jurisdiction on the Forest. The ENF performs minor reconstruction and maintenance of county roads, under cooperative agreements, when needed, because of heavy logging truck traffic. Such work may range from dust abatement to widening. The Forest also works with the Federal Highway Administration (FHWA) to secure funding for reconstructing and improving County roads that serve as key transportation routes into the Forest. These County roads are designated as Forest Highways. Over the past decade Forest Highway projects have been completed on several roads, including improvements to the Wentworth Springs Road (El Dorado County 63, Forest Highway 137), the Bear River Road (Amador County 244, Forest Highway 184) and the Blue Lakes Road (Alpine County 5, Forest Highway 134).

U.S. Highway 50 bisects the Forest from near Pollock Pines in the west to east of Echo Summit. This 35-mile route is the primary access route into the ENF. Highway 50 also serves as the primary route for goods and services being moved in and out of the Forest and as a link between the population centers of Sacramento and San Francisco and the recreation areas of the Lake Tahoe Basin. U.S. Highway 88, a National Forest Scenic Byway, traverses the Forest from near Cooks Station in the west to Carson Pass in the east. This 43-mile route is a major route for hay trucks traveling between the growing areas in western Nevada and the feedlots in the Central Valley of California. The highway also serves as a carrier of goods and services to and from the Forest, but to a lesser degree than Highway 50. Although the alignment and width of Highway 88 makes it less desirable as a through route, resulting in a lower overall use than Highway 50, the scenic qualities and panoramic view do attract many recreational visitors who make up a larger percentage of the total use on Highway 88 then on Highway 50. State Highways 49 and 193, although not within the Forest boundary, are instrumental in transporting goods and services from north to south, serving as collector routes to Highways 50 and 88.

Almost all national forest visitors travel at some point on national forest system roads. Roads have opened the Eldorado National Forest to millions of national and international visitors. They are also an integral part of the transportation system for rural counties. Forest roads provide access for recreation, research, fish and wildlife habitat management, grazing, timber harvesting, fire protection, mining, insect and disease control, and private land use.

National forest system roads are not public roads in the same sense as roads that are under the jurisdiction of State and county road agencies. National forest system roads are not intended to meet the transportation needs of the public at large. Instead, they are authorized only for the use and administration of national forest lands. Although generally open and available for public use, that use is at the discretion of the Secretary of Agriculture. Through authorities delegated by the Secretary, the Forest Service may restrict or control traffic to meet specific management direction (USDA Forest Service, Forest Service Manual 7731).

Roads are located, designed, constructed or reconstructed, and managed commensurate with the potential use, the resource served, and the traffic service level. Traffic service levels describe the significant traffic characteristics and operating conditions for a road. These levels are identified as a result of transportation planning. Road Management Objectives (RMO) are established for each road and may be expressed in terms of the area and resource to be served, environmental concerns, amount and type of traffic, life of facility, and functional classification. Similarly, Trail Management Objectives (TMO) are established for each system trail.

The construction/reconstruction activities performed on the system roads and trails comply with standard construction practices and are controlled by the use of plans and specifications. Methods for protecting the resources during and after construction are contained in the best management practices (BMP) for the construction of roads. Examples of these BMP include no side casting of material into streams (BMP 2-11), a prohibition against constructing roads in saturated soils (BMP 2-3), and hydroseeding of exposed slopes (BMP 2-4).

Road Construction and Reconstruction

The network of NFS roads was primarily constructed in support of the logging program. The majority of the forest roads in the Eldorado National Forest were built for timber harvest access between 1950 and 1990, although the higher standard roads were intended and designed for multiple uses including public access. In the Sierra Nevada, the Forest Service as a whole constructed about 950 miles of road per year in the 1970’s, and 308 miles/year in the 1980’s, but only 8 miles per year between 1994 and 1999. The level of timber harvest has declined substantially since the 1993 implementation of the California Spotted Owl Sierran Province Interim Guidelines, and there has been a corresponding decrease in the amount spent to maintain the road system.

Even though the size of the timber program on the Forest has shrunk, the majority of road construction and reconstruction costs on the ENF continue to be financed through timber sales. During the five-year period between 2003 and 2007, timber sales contributed $ 3,700,000 of work on the road system, constructing 1.25 miles of new road and reconstructing 243 miles of existing roads. Safety and resource protection will continue to be a high priority for road reconstruction work performed through timber sales. The upgrading of older existing roads to meet current needs will primarily be funded in this manner.

The remainder of the road construction and reconstruction that takes place on the Forest is in the form of public works contracts. During the five-year period between 2003 and 2007, the Forest received $1,258,000 earmarked for special projects. This funding allowed the Forest to complete two bridge projects, perform improvements at three trailheads and extend the chipseal surfacing on the Rock Creek road. Public works projects are funded through appropriated dollars. The ENF will continue to seek funding for road improvements through the existing competitive processes.

Road Maintenance

The Road Maintenance and Operations System classifies all roads into one of five maintenance levels. Maintenance levels (ML) 1 through 5 are defined in the glossary toward the end of this document. The Alternatives considered in this EIS are focused on ML 1 and 2 roads.

Maintenance needs on roads are further divided into two categories- Traffic Generated and Non-Traffic Generated maintenance. Traffic Generated maintenance needs are those associated with the use of a road. In general, as use on a particular route increases so does the traffic-generated maintenance needs. Non-Traffic Generated maintenance is independent of the use of a road. For example, the growth of tree limbs and brush creates a maintenance need, but the growth is independent of the volume of traffic the road receives. The average maintenance cost for a ML 2 road that is open to public traffic is estimated to cost $603 per mile each year, while the average maintenance cost for a ML 2 road that is closed to public traffic is estimated at $321 per mile. The difference between the two figures is the average cost of the traffic generated maintenance.

Maintenance work on the Forest road system is funded in a number of ways. First, the Forest receives appropriated funds from Congress through the annual budget process. Second, collections are made through the issuance of commercial road use permits. A third method is through appraised values on timber sales, where Purchasers are granted an allowance for performing traffic-generated maintenance and this allowance is applied against the purchase price of the timber. Fourth is work performed by cooperators under Cost Share agreements. Fifth is work performed by volunteers, and sixth is work funded by financial grants outside of the routine appropriation process. Table 3-K.1 displays the sources of funding by category for the 5 year period between 2003 and 2007.

3-K.1: Sources of Funding for Roads Maintenance

Source of Funding	Total Received (2003-2007)	Annual Average
Appropriated	$ 1,400,000	$ 280,000
Collections	1,280,000	256,000
Timber Sale Maintenance	1,600,000	320,000
Cost Share (est. value)	1,120,000	224,000
Volunteers	0	$0
Grants	1,356,000	271,000
Total Available	6,756,000	1,351,000

Note: Appropriated Funds shown are the estimated amount spent on road maintenance, and are 42% of the total road funding received during that period. Collections include $1,241,000 in Surface Replacement deposits. Grants include $1,356,000 received from FHWA for ERFO repairs from the 1997 storm event.

During the 5 year period between 2003 and 2007, the Forest maintained an average of 200 miles of the road system each year using appropriated funds and collections. In addition, timber sales during the same period performed $320,000 of routine maintenance on roads used for logging traffic. Portions of the road system are also maintained each year by our Cost Share cooperators, who are responsible for maintaining 6.6 miles of ML 1, 7.5 miles of ML 2, 28.6 miles of ML 3, 22.9 miles of ML 4 and 12 miles of ML 5 roads. The use of volunteers to accomplish road work has not been tracked in the past, but a brushing project was accomplished this winter by the Friends of the Eldorado group on the Cosumnes Mine Road. In 2006, the Forest road and trail system was damaged by an intense storm that qualified for supplemental funding administered by the Federal Highway Administration (FHWA). Twenty-two road sites and one trail site qualified for $1.35 million in emergency (ERFO) repairs.

Not all roads qualify for all sources of funding. Timber sale work is performed on roads used by the sales, and most of the maintenance work that is accomplished on ML 2 roads is accomplished through Timber Sales. Collections are primarily made from commercial users of our paved roads, and the funds collected are used to maintain those ML 4 and 5 roads. ML 1 and 2 roads do not qualify for ERFO funding in the event of a catastrophic event. In addition, higher maintenance level roads (ML 3-5) are subject to the Highway Safety Act and receive a higher priority for the use of appropriated funds.

Deferred Maintenance

Deferred Maintenance is defined as maintenance that was not performed when it should have been or when it was scheduled and which, therefore, was put off or delayed for a future period. When allowed to accumulate without limits or consideration of useful life, deferred maintenance leads to deterioration of performance, increased costs to repair, and decrease in asset value. As the Road Maintenance budget has decreased over the years, more of the annual maintenance needed on the road system has been deferred.

Deferred Maintenance needs exist on the Eldorado, but we lack the data to accurately calculate the value of that need. The root issue is that the Deferred Maintenance number is statistically valid, but only at the national level. In addition the methodology for collecting the information has changed over time at the Forest level, but the Deferred Maintenance need reported for the Forest has been reported as if the old methodology was still being used. Nationally, the effort to calculate Deferred Maintenance began in 2001. The national direction was to survey 25% of the road system on every Forest each year, so every road would be inspected on a four year cycle. In 2002, the direction was modified and each Forest was to inspect 25% of the ML 3-5 roads each year and to complete surveys on a few ML 1 and 2 roads that were chosen nationally in a random sample. The surveys of these ML 1 and 2 roads were done by the same personnel and used the same techniques as the surveys on the ML 3-5 roads, but the results were used to establish a national value for deferred maintenance. By 2004, each Forest was to complete surveys on any remaining ML 3-5 roads that had not been previously surveyed, and in that year the Eldorado was assigned two ML 2 roads measuring a total of 0.6 miles and one ML 1 road measuring 0.3 miles in length as part of the national random sample. In 2007, national direction on the surveys changed again, and we went to a random sample method on all roads. The Eldorado was assigned three roads to survey that year, with a combined length of 0.9 miles. We can't accurately estimate the maintenance needs on close to 2900 miles of system roads by reviewing 2-3 roads each year. The Eldorado plans on exceeding the national direction on the condition surveys, and the road maintenance costs included in this analysis are based on a premise that every road will be inspected on a 5 year cycle.

There are indicators that strongly support the statement that the Forest has a Deferred Maintenance backlog. One indicator was a statistical sample of our paved road system done in 2005 and paid for by FHWA. That study (Harris and Associates) looked at pavement condition and concluded that our pavement was nearing the end of its design life. It predicted that the rate of deterioration would be increasing, and called for an annual expenditure on the ML 5 asphalt road system of $2,200,000 per year. The same report estimated that there was a Deferred Maintenance backlog of $3.4 million on the asphalt roads, and that figure could increase to $11.5 million by 2010 if the Forest could only afford to invest $100,000 per year on maintaining that pavement. This recommended expenditure and projected backlog did not include what we would need to spend on the remainder of our road system.

Road Management

The Eldorado NF completed a Forest-level Roads Analysis Process in September of 2003. This Forest scale analysis addressed the arterial and collector roads that were part of the Forest transportation system at that time. The analysis did not address local, non-system or user-created roads. The arterial and collector roads were for the most part Maintenance Level 3, 4 and 5 roads. Some of the key findings from that analysis were:

- The existing arterial and collector road system provides the necessary access for current and anticipated future needs.
- Road maintenance funding is not adequate to maintain and sign roads to standard.
- Traffic levels that exceed the current road design, types of use, and lack of maintenance on individual roads are cause for safety concerns. Emergency access and egress may not be adequate in some areas.
- Potential environmental consequences from the road system need to be prioritized and evaluated for future analyses at a landscape level scale.

High road densities in some areas of the Forest may be causing impacts to resources and users.

Shared maintenance is occurring but could be improved on key access roads.

While the volume of logging traffic has decreased over the past decade, public use of the forest road system for recreation access has grown steadily. In 1950, the ratio of recreation to timber traffic was about 10 to 1 nationally. In 1975, the ratio was 27 to 1. In 1996, the ratio was estimated at 114 to 1. Driving for pleasure is the single largest recreational use of Forest Service managed lands (see Recreation section).

Mixed Use

The California Vehicle Code defines a “Highway” as “…a way or place of whatever nature, publicly maintained and open to the use of the public for the purposes of vehicular travel” (CVC 36). The State vehicle code goes on to state that; “For the purposes of this division, the term “highway” does not included fire trails, logging roads, service roads, regardless of surface composition, or other roughly graded trails and roads upon which vehicular travel by the public is permitted. After consulting with the State, the Forest Service has determined that in California this State definition of a “highway” is considered equivalent to Forest Service Maintenance Level 3, 4 and 5 roads. The State term “highway” does not apply to Forest Service Maintenance Level 1 and 2 roads, nor does it apply to motorized trails.

Under the California Vehicle Code un-licensed unregistered Off Highway Vehicles (OHV’s) may not be operated on “highways”. The State does allow designation of a “highway” for use by both OHV and street legal vehicles if a Combined Use study is completed. Completion of a Combined Use study and the resulting designation allows a licensed, insured individual to operate an OHV on the route. The Eldorado completed a Combined Use study in cooperation with El Dorado County in the spring of 2007. As a result, 5 miles of roads were designated on the Pacific RD.

The Forest Service can pre-empt state law if it is found that the maintenance Level 3, 4 or 5 road is designed and constructed so as to permit the use by regular vehicular traffic along with the operation of OHV’s on that road. The process the Forest Service uses to make that determination is called “Mixed Use Analysis”.

National Forest System (NFS) roads are designed primarily for use by highway-legal vehicles (motor vehicles that are licensed or certified for general operation on public roads within the State), such as a passenger car or log truck. Some NFS roads also provide recreational access for all-terrain vehicles and other non-highway-legal OHVs. Motorized mixed use is defined as designation of an NFS road for use by both highway-legal and non-highway-legal motor vehicles (USDA Forest Service, Engineering Manual 7700-30). Designating NFS roads for motorized mixed use involves safety and engineering considerations.

The policy of Region 5 is to conduct a motorized mixed use analysis on all maintenance level 2 roads as well as any maintenance level 3, 4, or 5 road where mixed use is proposed. The baseline for the analysis will be Forest Service regulations and directives and applicable State and local laws. The qualified engineer will determine how detailed the analysis is to be and may choose to do an evaluation based on factors in Engineering Manual 7700-30, or other factors. (*Qualified Engineer* is defined as “An engineer who by experience, certification, education, or license is technically trained and experienced to perform the engineering tasks specified and is designated by the Director of Engineering, Regional Office” (FSM 7705)). The qualified engineer determines the factors to be considered for the specific road, road segment, or road system being analyzed in consultation with recreation managers or others familiar with operation of non-highway-legal vehicles and with travel management cooperators. The level of analysis is to be based on personal knowledge, expertise, and experience.

Based on the analysis conducted, the qualified engineer will identify risks and prepare recommendations for the appropriate responsible official. The recommendations may include mitigation measures that would reduce the risk associated with designating the road for motorized mixed use.

NFS Trails

There are 150 miles of NFS motorized trails and 310 miles of NFS non-motorized trails in the Forest transportation system (excluding the Rock Creek area). The motorized trail mileage includes 86 miles of routes that are along existing roads. Motorized trails usually have a tread width of less than 50 inches, unless they are routed along existing roads.

There are three National Recreation Trails on the ENF of particular interest.

Pacific Crest Trail (25.6 miles)
Pony Express Trail (21.7 miles)
Emigrant Summit Trail (16.7 miles)

In addition to their designation to the National Recreation Trail System, the Pony Express Trail and the Emigrant Summit Trail may meet the criteria for designation as National Historic Trails. Such a designation requires an act of Congress. Currently, these trails are being studied for designation. The remaining trails on the Forest are considered local trails. A description and background of these trails can be found in the Recreation Section in Chapter 3.

Trail Construction and Reconstruction

The Forest successfully competed for $205,000 in earmark funding between 2003 and 2007 to complete improvements on Trailheads. This was in addition to the special funding received for projects in the Rock Creek area.

Trail Management, Maintenance and Operations

Work on the Forest trail system is funded in a number of ways. First, the Forest receives appropriated funds from Congress through the annual budget process. Second, the Forest competes for earmarked funds that also come from Congress. Third is work funded by financial grants outside of the routine appropriation process. Fourth is work performed by volunteers. Table K-3.2 displays the sources of funding by category for the 5 year period between 2003 and 2007.

Table K-3.2: Sources of Funding for Trails Maintenance

Source of Funding	Total Received (2003-2007)	Annual Average
Appropriated	$589,000	$118,000
Maintenance Earmarks	$116,000	$23,000
Grants	$73,000	$15,000
Volunteers	$52,000	$10,000
Total Available	$830,000	$166,000

Note: Volunteer figures were only available for FY 2007. Grants include $65,000 of Greensticker funds received in FY 2006 for trail maintenance, and $8,000 received from FHWA for ERFO repairs to trails from the 1997 storm event.

Appropriated funds spent on trail maintenance over the past 5 years average $28,000. However, this figure is somewhat misleading. The Forest has successfully competed for an average of $23,000 in annual maintenance funding earmarks, and received one grant from the State during this period to accomplish $65,000 of trail maintenance work. This level of funding has allowed us to open approximately 100 miles of the trail system at the beginning of each field season, and to maintain an average of 27 miles per year of the trail system to standard.

Recently the State of California passed new legislation regarding the distribution of grants and cooperative agreements from the California OHV Trust Fund. The new legislation (SB 742, signed by Governor Schwarzenegger on October 12, 2007) provides a greater amount of funding available for trail maintenance. This funding source is still a competitive grant process, and so there is no assurance that the Forest will receive funding from the OHV Trust Fund in the future, however the prospects are encouraging.

During the 5 year period between 2003 and 2007, the Forest maintained an average of 27 miles of the trail system to standard each year using appropriated funds. Additional funding was received as earmarks that were used to construct or reconstruct new trails, trailheads and trail bridges.

Deferred Maintenance

Deferred Maintenance needs exist on the trail system on the Eldorado, but we lack the data to accurately calculate the value of that need. Surveys of some trails have been done based on a national random sample. For the past three years (2003-2007), we have been removing fallen trees on the 70-100 miles of trails that we actively open each year. Approximately 5 miles of the trail system has been annually maintained to standard during the same three-year period. All other work has been deferred.

Unauthorized Routes

There are 526 miles of low standard, unauthorized routes within the Forest. Many of these routes predate the establishment of the Forest. They are not part of the forest transportation system.

About 25 percent were built by timber purchasers, miners, and permittees prior to the 1960s and have since lost their usefulness in serving land management activities. Unauthorized routes also originated as temporary logging roads, skid trails, or firelines. Many of these were never intended for use by vehicles but were never rehabilitated, and over time have been used by the public, even though they are not maintained. Over the past 30 years, Forest users have also created other unauthorized routes by driving cross-country through the Forest.

Analysis Framework

Background

Changes to transportation facilities among the alternatives are primarily recreation related. The effects associated with such changes can be found in the Recreation Section later in Chapter 3. The environmental consequences described in this section will focus on maintenance level changes and the cost for maintaining the proposed Alternatives.

This analysis focuses on all proposed ML-2 roads and NFS motorized trails in each Alternative allowing for public wheeled motor vehicle use, as well as all surfaced ML-3 through ML-5 roads already designated open for public motor vehicle use.

Data

For a discussion of data use see the beginning of Chapter 3.

The estimated cost of maintaining the NFS road system was developed using the Road MEO (Most Efficient Organization) task list and the suggested frequencies for the individual maintenance activity. For example, on a ML-3 road, roadside ditch maintenance is recommended every five years at a cost of $110 per mile. Once this cost is averaged across years, the resulting annual roadside ditch maintenance cost is $22 per mile. The estimated annual road and trail maintenance costs used for this analysis are ML-1 - $170 per mile; ML-2 administrative roads - $321 per mile; ML-2 designated roads - $603 per mile; ML-3 - $1,296 per mile; ML-4 - $4,959 per mile; ML-5 - $5,626 per mile; and NFS trail - $429 per mile. Since these are average costs, the frequency of maintenance needed on an individual roads or trail may vary for a variety of reasons.

Assumptions

For a discussion of the general assumptions used in this analysis see the beginning of Chapter 3.

- 42% of the roads budget allocation is spent on road maintenance (based on an analysis of 2003-2007 expenditures).
- The majority of the appropriated funds spent on road maintenance are spent on roads subject to the Highway Safety Act (Maintenance Level 3-5).
- Almost all of the maintenance work that is performed on ML 2 roads is accomplished through Timber Sales.
- 100% of the Surface Replacement and Road Maintenance collections are spent on road maintenance of ML 3-5 roads.
- 24% of the trails budget allocation is spent on trail maintenance (based on an analysis of 2003-2007 expenditures).

Indicator Measures

Indicator Measure 1*:* Annual costs of maintaining roads, as needed, allowing for public wheeled motor vehicle use.

Indicator Measure 2: Costs of maintaining trails allowing for public wheeled motor vehicle use over a three year cycle, as needed.

Environmental Consequences

Direct, Indirect and Cumulative Effects for All Alternatives

Roads

The following table summarizes changes in classification of NFS roads and unauthorized routes by miles for each Alternative.

Table 3-K.3: Changes in classification of NFS roads and unauthorized routes

Existing Classification	Proposed Classification	Alternatives					
		A	B	Mod B	C	D	E
NFS ML-1 Road	NFS ML-2 Road	0	150	99	133	66	1
NFS ML-3 Road	NFS ML-2 Road	0	164.6	48.5	164.6	154.2	145.4
NFS ML-4 Road	NFS ML-2 Road open to Highway and non-Highway Vehicles	0	20.1	1.2	20.1	18.8	19.4
NFS ML-5 Road	NFS ML-2 Road open to Highway and non-Highway Vehicles	0	0.2	0.4	0.2	0.2	0.2
Unauthorized Routes	NFS ML-2 Road	0	27	17	15	19	13

Table 3-K.4: Proposed Classification of NFS Road System

Proposed Classification	Alternatives					
	A	B	Mod B	C	D	E
NFS ML-1 Road	722	558	611	581	643	723
NFS ML-2 Road Open to Public Travel	1030	1120	1002	1068	847	714
NFS ML-2 Road Closed to Public Travel	154	371	279	397	547	634
NFS ML-3, 4 and 5 Roads	680	485	635	485	485	485
Roads Converted to Trails	0	70	64	62	69	19
Total Road Mileage	2586	2464	2463	2469	2453	2537

Based on the estimated road maintenance costs described above, the following table describes the annual costs of maintaining roads allowing for public wheeled motor vehicle use.

Table 3-K.5: Estimated annual maintenance costs of Forest Roads

Operational ML	Alt A	Alt B	Alt Mod B	Alt C	Alt D	Alt E
ML-1 Roads	$ 123,000	$ 95,000	$ 104,000	$ 99,000	$ 109,000	$ 123,000
ML-2 Road Open to Public Travel	621,000	675,000	604,000	644,000	511,000	431,000
ML-2 Road Closed to Public Travel	49,000	119,000	90,000	127,000	176,000	204,000
ML-3, 4 and 5 Roads	2,611,000	2,262,000	2,530,000	2,253,000	2,284,000	2,283,000
Total needs	3,404,000	3,151,000	3,328,000	3,124,000	3,080,000	3,040,000

During the period analyzed (2003-2007), the average spent by the Forest on an annual basis was $1,351,000, which falls short of the need calculated for any of the alternatives. It needs to be noted that there isn’t a complete correlation between the funding available and the funding needed, because some roads receive funding from more than one source. For example, a mile of Specified Road in a Timber Sale will receive work funded by the Sale, and then will also be maintained by the Purchaser during haul. This additional work is needed to deal with Traffic-generated maintenance and is also paid for by the Timber Sale. Even without this direct correlation, the conclusion is valid that we don’t have enough funding available to accomplish the needed work.

We do have a strategy for dealing with the difference between what is needed and what is available. First, we will be reducing road maintenance levels on some roads in the future, concentrating on the ML 3-5 roads since these are so much more expensive to maintain. Second, as we go through the FERC licensing process we will be asking the licensees to pay their fair share of the maintenance on the roads that they use. Third, we will look for opportunities to apply for funding through the grant process. And fourth, we will make an effort to build on the public's interest in volunteering.

Mixed Use

On the Eldorado, Mixed Use has been occurring on ML 2 roads for a number of years. A review of the available accident information was done as part of the process of preparing this EIS, and no unusual risks or accidents attributed to mixed use were identified on the ML 2 routes that are being proposed in these alternatives. The proposal under the various alternatives to designate differing numbers of Mixed Use routes was based on the various goals of those alternatives, and was not done in response to any known safety issues. The goals of each Alternative are spelled out in detail in Chapter 2.

A Mixed Use analysis using the engineering judgment method has been prepared for the ML 2 roads that are proposed for Mixed Use designation under Modified Alternative B. This analysis includes those Unauthorized Routes that are being added to the road system as ML 2 roads.

The possible future designation of ML 3-5 roads for Mixed Use isn't a part of any of the alternatives considered in this FEIS.

Trails

Table 3-K.6 Changes in classification of NFS roads, NFS trails, and unauthorized routes by miles for each Alternative.

Existing Classification	Proposed Classification	Alternatives					
		A	B	Mod B	C	D	E
NFS ML-2 Road	NFS Trail open to High Clearance Vehicles	0	47	47	47	45	11
	NFS Trail open to ATVs and MCs	0	5	4	4	7	5
	NFS Trail open to MCs only	0	1	1	1	1	0
NFS ML-1 Road	NFS Trail open to High Clearance Vehicles	0	1	1	0	0	0
	NFS Trail open to ATVs and MCs	0	6	4	1	6	0
	NFS Trail open to MCs only	0	10	7	9	10	3
Unauthorized Routes	NFS Trail open to High Clearance Vehicles	0	4	3	2	4	3
	NFS Trail open to ATVs and MCs	0	11	4	3	10	5
	NFS Trail open to MCs only	0	4	0	0	1	0

Table 3-K.7: Proposed classification of the NFS trail system

Proposed Classification	Alternatives					
	A	B	Mod B	C	D	E
Non-motorized Trails	310	310	310	310	310	310
NFS 4WD Trail open to High Clearance Vehicles	10	60	58	57	56	14
NFS Trail open to ATVs and MCs	24	49	37	31	47	34
NFS Trail open to MCs only	116	133	115	89	113	83
Total Motorized Trail Mileage	150	242	210	177	216	131
Total Trail Mileage	460	552	520	487	526	441

Note: The mileage shown under Alternative A for "NFS 4WD Trail open to High Clearance Vehicles" is currently a combination of 4WD roads and trails.

Table 3-K.8: Estimated annual maintenance costs of Forest Trails

Trail Classification	Alt A	Alt B	Alt Mod B	Alt C	Alt D	Alt E
Non-motorized	$133,000	$133,000	$133,000	$133,000	$133,000	$133,000
Motorized	64,000	104,000	90,000	76,000	93,000	56,000
Total needs	$197,000	$237,000	$223,000	$209,000	$226,000	$189,000

Based on historical funding, it is unlikely that the Forest can maintain to standard the NFS motorized trails open for public use in any alternative. However, there are various opportunities to accomplish the needed work through grants and volunteer work that could help overcome deficiencies in appropriated funding for maintaining NFS motorized trails.

Unauthorized Routes

None of the alternatives add roads that will be maintained for passenger cars. However, even roads maintained for high-clearance vehicles need periodic maintenance, especially after large storm events. The addition of any roads presents administration needs. For example, all new roads must be added to the INFRA database and recorded as real property. They also necessitate regular inspections.

The unauthorized routes that are proposed in the alternatives as additions to either the road or trail system have been reviewed on the ground and do not present any unusual safety concerns that differentiate them from our current system roads and trails. The annual maintenance needs on the unauthorized routes that are proposed as additions are expected to be about the same as the annual maintenance cost on similar system roads or trails.

Unauthorized routes are discussed in more detail in Chapter 2.

L. Mineral Resources

Affected Environment

Miners, prospectors, and owners of unpatented mining claims have a statutory right of reasonable access under the mining laws. Surface uses under the mining laws, including motor vehicle access to and across NFS lands that are open to mineral entry are regulated under the provisions of the FS regulations at 36 CFR 228 Subpart A.

A Minerals Resource Overview (refer to ENF LRMP) was prepared to assess the present and future potential for the development and exploration of nonrenewable mineral resources on the ENF. A review of available literature has resulted in the following summary.

Mineral resources can be divided into locatable, leasable, and salable resources. Locatable minerals are “hardrock minerals” such as gold, silver, copper, lead, and zinc (essentially all metallic minerals) found on public domain status land. Leasable minerals include energy minerals such as oil, gas, geothermal, and other specific minerals that are found on both public domain and acquired status lands. Salable minerals include common varieties of minerals such as building stone, clay, gravel, limestone, and sand. They are always salable regardless of the land status where they are found.

The ENF and adjacent lands contain occurrences of gold, silver, copper, zinc, manganese, tungsten, chromite, nickel, uranium, platinum, mercury, titanium, iron, building stone, limestone, slate, clay, marble, soapstone, sand, and gravel. Of most importance to the management of the ENF is gold. This activity occurs primarily within the western portion of the Forest, particularly in the Georgetown area and in the area east of Grizzly Flat.

Lode gold deposits (“hard rock” occur on the Forest in the Mother Lode System, the East Belt, and as isolated deposits in the Sierra Nevada granite rocks. The most productive areas, by far, both for lode and placer deposits, have been on or near the Mother Lode System. Except for the immediate Georgetown area, the Mother Lode System generally lies west of the Forest. The East Belt resources, the localized mineralization in the Sierra Nevada granite rocks, and the placer deposits of gold lying east of the Mother Lode, are of most significance. Placer mining for gold continues on the Forest although the intensity of activity fluctuates with the price of gold and other economic factors. Very little locatable mineral extraction and development has occurred on the Forest in the last decade and there are no actively producing mines at this time..

Leasable mineral resources on the ENF consist of very limited geothermal potential. This involves the Wentworth and Myers hot springs, which are both in and adjacent to the Forest. However, none of the Forest is identified as having “known” or “inferred” potential, nor is it identified as being “favorable” for the occurrence of thermal water of sufficiently high temperatures for direct heat application (California Division of Mines 1983). The Bureau of Land Management (BLM) has likewise not identified any portion of the Forest as “known” geothermal resource area, or as being “prospectively valuable” for geothermal resources. Other leasable mineral resources such as oil, gas, coal, sodium, and phosphate are not known on the Forest.

Saleable mineral resources (commonly known as “mineral materials”) consist principally of landscaping rock, building stone, slate, rubble, and crushed stone. These materials are found across the Forest and are commonly collected by individuals for personal use. There are some notable exceptions in which crushed rock for road base or other purposes have been extracted from NFS lands.

Analysis Framework

Introduction

The primary effect on mineral resource development and extraction from public wheeled motor vehicle travel management is from limited or reduced access to public lands for prospecting and exploration purposes. Individuals and companies prospect or explore for minerals, in part, by mapping the geology of specific areas, collecting mineral samples, and conducting other geophysical tests. These various methods are commonly facilitated by the use of public wheeled motor vehicles for access and hauling of equipment. Those alternatives with reduced public wheeled motor vehicle access, particularly within the western portion of the Forest where mineral resources are more likely to occur, may have the affect of reducing access for prospecting or exploration, with the subsequent effect of a reduction of discovery of new mineral resource commodities.

Individuals or companies that conduct prospecting and exploration activities are not usually required to obtain a permit or other form of authorization, pursuant to 36 CFR 228, but must comply with other Forest rules and regulations. Access associated with mineral development activities, such as for an active mine, is commonly dealt with through a Plan of Operations or Notice of Intent, pursuant to 36 CFR 228. In the event that ground disturbing activities or the use of public lands are such as to warrant the need for a Plan of Operations, an environmental analysis will be completed This Plan of Operations or other authorization may include the use of specific roads or trails not otherwise open to public wheeled motor vehicle use.

Data and Assumptions

For the data and assumptions used in this analysis refer to the beginning pages of Chapter 3.

Indicator Measures

Indicator Measure 1: Number of miles of roads and trails open for public wheeled motor vehicle use that provides access for prospecting and mineral exploration.

Indicator Measure 2: Ability to travel cross-country with a wheeled motor vehicle for prospecting and mineral exploration.

Environmental Consequences

Direct and Indirect Effects for All Alternatives

Indicator Measure 1: Table 2-17 in Chapter 2, shows the number of miles of road and trails open for public wheeled motor vehicle use for each Alternative. Alternatives with a higher number of miles of roads and trails open for public wheeled motor vehicle use would provide a greater opportunity for prospecting and mineral exploration, which may lead to a higher likelihood of discovery of a significant mineral resource. Thus, the opportunity for prospecting and exploration decreases from Alternative A to Alternative E. Modified B is similar to Alternative B in effects. Seasonal closures will further reduce the opportunities for mineral prospecting, but to a lesser extent than restrictions to general access.

Indicator Measure 2: There is greater opportunity for prospecting and exploration in Alternative A since cross-country travel is not prohibited for public wheeled motor vehicles. The action alternatives (B-E, including Modified B) prohibit cross-country travel, further reducing opportunities for prospecting and mineral exploration.

Cumulative Effects for All Alternatives

Geographic Scale

The geographic scale to assess cumulative effects related to mineral resources includes the project area, as described at the beginning of Chapter 3. However, wilderness areas on the ENF are not included, since motorized use, as well as prospecting and mineral exploration, is not allowed in wilderness areas.

Analysis

Other Forest management activities or natural events that lead to road or trail closures will add to the cumulative effects by reducing motorized access for prospecting and exploration. Past and ongoing projects have lead to a limited number of closures of roads or trails. Foreseeable future activities, such as the fuels reduction projects listed in Appendix E, may lead to further closures, but is expected to be similar in scale to past projects. These closures will be analyzed in future environmental documents.

M. Special Uses

Affected Environment

Special uses on the ENF consist of a variety of commercial and individual uses such as hydroelectric power generation; communication sites; power lines; telephone lines; water lines for domestic purposes; apiaries; and road permits for individual access to private lands, ski resorts, recreation events (including wheeled motor vehicle events), organization camps, recreation residences, and grazing allotment management. These uses of NFS lands occur across much of the Forest. Their use, and their associated activities (including operation and maintenance of any facilities), are conducted under a special use permit or other form of authorization either from the Forest Service or some other agency, such as the Federal Energy Regulatory Commission.

Analysis Framework

Assumptions

For a list of assumptions used in this analysis refer to the beginning of Chapter 3

Environmental Consequences

Direct, Indirect, and Cumulative Effects for All Alternatives

Since these special uses and activities are specifically authorized by the Forest Service or some other agency, any necessary use of roads or trails may also be authorized within the same instrument. The recently promulgated Forest Service Regulations at 36 CFR 212 recognize that motor vehicle use may be authorized as part of a special use authorization, and as such, the permit holder may use routes that are otherwise not open for general public use. Therefore, the designation of motor vehicle routes for public use will not have any direct effects on these uses or activities. However, where these permit holders are using existing roads or trails, there may be an indirect effect, in that permit holders may have an increased responsibility for maintenance or protection of those roads or trails not otherwise open to the general public. In some cases, permit holders may be using unauthorized routes to access permitted facilities. In cases where routes are not open for public use, permit holders will be responsible for maintaining routes and may need to install barriers or gates to eliminate unauthorized public use

N. Adjacent Land Ownership

Affected Environment

A mingled land ownership pattern exists within the ENF boundary. The gross area within the boundary is 605,249 acres. Lands of other ownership comprise approximately 24 percent of this total. These other ownership lands range in size from less than one acre to several thousands of contiguous acres. SPI is the largest private landowner within the Forest boundary, with approximately 130,000 acres in or adjacent to the Forest. Many of the privately-held parcels are isolated and enclosed on four sides by NFS ownership. An opposite pattern occurs outside the Forest boundary where several small, scattered parcels of NFS land are separated from the main body of the Forest and are surrounded by lands of other ownership.

As a result of this pattern, user and landowner conflicts have increased as society has urbanized and contrasting land philosophies have grown between federal agencies, state and local governments, private-commercial forest owners, and private landowners. These conflicts are primarily related to wildlife habitat, public road and trail access, resource damage from motorized use, use of NFS roads to access areas of private development, risk of wildfires, litter and pollution, law enforcement, and management of adjacent NFS lands. It is now the policy of some private-commercial forest owners that their lands are not open for public use. For example it is the policy of SPI that non-motorized recreational use of their lands is generally allowed, and that motorized use of their land requires issuance of a permit and is limited to existing roads. However, private land owners in general and SPI in particular continue to experience public trespass on their lands primarily for motor vehicle use and dispersed camping.

Ownership patterns vary markedly from one portion of the Forest to another. Most pronounced are those variations within the northern two-thirds of the Forest and along the western boundary. The northernmost section is characterized by a checkerboard pattern, with ownership divided unevenly into several large holdings. To the south of this lies a large, and fairly contiguous, inholding of SPI. The majority of private land located between Highway 50 and the Mormon Emigrant Trail (MET) is also under SPI ownership. American Forest Products Company controls most of the inholdings grouped south of Highway 88 and west of the Bear River Reservoir. All of these large ownerships are managed primarily for timber production, and in general, present little or no conflict with management of the surrounding NFS land for recreational purposes. One exception involves the policy of SPI prohibiting public motorized access without a permit and its effect on motor vehicle use and dispersed camping.

The ENF has entered into cooperative agreements with many of the major private land owners within the Forest, such as SPI. These agreements are made in an effort to share the costs of Forest road construction, reconstruction, and maintenance. These cost share roads are generally operated under Forest Service jurisdiction and involve an exchange of easements. In some cases, the easements restrict public access rights. This program has provided the Forest, as well as the cooperating parties, an opportunity to combine transportation systems, thereby reducing cost and increasing benefits. Some of the commitments made under the cooperative agreements are:

- an Annual Maintenance Plan will be developed for roads under the agreement or any supplements,
- the roads will be maintained to preserve the standards of construction or reconstruction,
- the Forest Service is responsible for the public's share of maintenance on paved and bituminous surfaced roads,

and that the Forest Service is responsible for the non-traffic generated maintenance along paved and bituminous surfaced roads.

In general, those roads covered by cooperative agreements are given priority when planning the expenditure of annual maintenance funds by the Forest Service.

Outside of these cooperative agreements, rights-of-way on existing roads and trails across these mingled ownerships are currently a problem. During this Travel Management effort it was discovered that 225 NFS roads and 3 motorized trails within the Forest boundary that are displayed on past public maps, do not have a documented public right-of-way. An additional 10 NFS roads have limited easements that do not allow public motorized access. The lack of right-of-way has caused problems with adjacent landowners in the past who have experienced increased damage to roads and/or trails, to their lands accessed by the transportation system, as well as increased vandalism, noise, and dust, from increased public motor vehicle use. With the exception of specific work described in the Alternatives, the resolution of this issue is outside the scope of the FEIS. There is clearly a need in the future to resolve this issue.

During public scoping, comments were received suggesting that the public had prescriptive rights over some of the routes that have traditionally been used by OHV's. Prescriptive access rights are public rights that may be exercised and asserted by any member of public, or entity acting on the public's behalf. Prescriptive rights must be affirmed by court decision. In the absence of a court decision, prescriptive rights are only alleged and may or may not be capable of perfection. In asserting access rights on behalf of the public at large, a showing must be made that there is authority to act in that representative capacity. Under state law, it is clear that counties are designated representatives of the public on access issues. Forest Service use of Prescriptive Rights to perfect access rights is relatively new, and needs careful consideration. This approach requires court action, is expensive, is adversarial, is subject to appeal, and thus there is a high degree of uncertainty. At this time it has only been tested in the Federal Tenth Circuit Court of Appeals. Given this uncertainty, it has generally been FS policy to defer to counties in the assertion of public access rights. A recent decision of the Federal Tenth Circuit Court of Appeals expressly found that the United States does have standing to assert rights on behalf of the public, Board of Commissioners for Garfield county, Colorado: United States of American v. W.H.I. Inc., No. 92-1070 (10th Circuit. April 1993). However, application of prescriptive law to trails and footpaths is as yet untested. Generally federal agencies, including the Forest Service, do not pursue prescriptive rights but rather work with private landowners to obtain a right-of-way or, in unique circumstances, exercise eminent domain. The Forest has worked with private landowners in the past to address specific situations and will continue to acquire rights-of-ways in the future as resources are available and as opportunities arise.

There are 334 miles of State and County roads within the Forest boundary. The majority of these roads are paved roads that serve as main arteries within the Forest boundary or that cross the Forest boundary to connect to major cities and towns. An exception is the famous Rubicon Trail, which is a native surface 4WD trail within the Forest boundary on which the County claims management jurisdiction. The Forest Service cooperates with the County management of this trail, but due to high volumes of use of this trail, route proliferation and resource damage occur on adjacent NFS lands under Forest Service jurisdiction.

There are currently 15 open motorized NFS routes that connect the Eldorado with adjacent Forests. Some of these routes are restricted in use, and are only open to street-legal vehicles. To the north, the ENF boundary is primarily adjacent to the Tahoe National Forest. There are currently 7 open motorized NFS routes that connect to the Tahoe National Forest. To the east, the ENF boundary is primarily adjacent to the Lake Tahoe Basin Management Unit and the Humboldt Toiyabe National Forest. Currently, there are 3 open motorized NFS routes that connect to the Lake Tahoe Basin Management Unit and 2 open motorized NFS routes that connect to the Humboldt Toiyabe. To the south, the ENF boundary is primarily adjacent to the Stanislaus National Forest. There are currently 3 open motorized NFS routes that connect to the Stanislaus National Forest. These routes are used by the public to travel among the four National Forests and one Management Unit.

Analysis Framework

Data

The data sources for this analysis include GIS layers identifying routes within ½ mile of privately owned property with existing residences and routes without documented public rights-of-way across private lands within the ENF boundary.

The GIS layer for routes within ½ mile of privately owned property with existing residences is based on private-residential property only and does not include commercial properties or properties without known existing private-residential residences. Some of these data were already available, while additional data were collected by Counties associated with the project area.

The GIS layer for routes without documented public rights-of-way across private lands within the ENF boundary was constructed by reviewing file records and maps at the ENF Supervisor's Office in Placerville, CA. Some routes without a documented public right-of-way cross multiple sections of private property in their entirety. As a result of time constraints, the individual segment(s) within these route lengths that do not have a documented public right-of-way were not identified.

Assumptions

For a general list of assumptions used in this analysis see the discussion at the beginning of Chapter 3. A list of specific assumptions related to adjacent land ownership follows.

- Routes across private property without a documented public right-of-way will not be designated.
- Based on the language in the standard and guideline relating to routes within ½ mile of privately owned property with existing residences, exceptions can be made to specific routes open for public OHV use within ½ mile

Environmental Consequences

Direct, Indirect, and Cumulative Effects

Alternative A

Indicator Measures 1-4: In Alternative A, the existing condition would continue as described in Chapter 2, as well as the Affected Environment in this section. This existing condition would include: (1) miles of routes being used across private property without a documented public right-of-way and their associated conflicts (e.g. trespass, vandalism, littering, noise, and dust); (2) numerous miles of routes being used by OHVs within ½ mile of privately owned property with existing residences and their associated conflicts (e.g. noise, dust, and route proliferation); (3) NFS and unauthorized routes being used to travel between the Eldorado, Tahoe, and Stanislaus National Forests; and (4) continued unauthorized use of adjacent private lands for OHV use and dispersed camping and their associated conflicts (e.g. illegal trespass, vandalism, littering, noise, dust, and resource damage). The displacement of public wheeled motor vehicle use onto adjacent lands would not be expected to change, nor effects to adjacent private resorts and cabins within the ENF boundary.

There would be no prohibition on public wheeled motor vehicle use for cross-country travel, nor any seasonal closure restrictions during wet weather periods, nor restrictions on wheeled motor vehicle OST. As a result, route proliferation, resource damage, and damage to road and trail surfaces during wet weather periods would continue. On the other hand, there would continue to be year-round recreation opportunities for public wheeled motor vehicle travel.

In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use. An additional 526 miles of unauthorized routes are receiving use, and there are 482 miles of ML 1 roads that have not been physically blocked that are also receiving use.

Alternative B

Indicator Measure 1: In this Alternative, routes across private property without a documented public right-of-way were removed if they were not needed to support the design of the Alternative or if the landowner requested that these routes not be open, such as SPI. However, if routes were critical to the design of the Alternative, the Forest Service identified them for designation and is currently pursuing right-of-way for public use. There are two examples of such cases.

The first example involves a route to the southwest corner of Ice House Reservoir that crosses SPI property. The route has been heavily used in the past to access Ice House Reservoir and picnic area and has not been blocked off by the landowner. However, because of SPI's request to not open routes across their property, we plan on working with SPI to acquire an agreement for a public right-of-way. If acquired, this route would be open to all public wheeled motor vehicle types.

The second route (09N05) is an approximately one mile segment that crosses six private landowners from the junction of Highway 88 to NFS land and Mud Lake road (09N05). This route is a necessary access point to popular OHV routes in the Mud Lake area used by 4WDs, ATVs, and motorcycles. To acquire a documented public right-of-way, the Forest Service has agreed through a Memorandum of Understanding (MOU) with the six landowners to pave the route to eliminate dust, install a gate at the beginning of the route to close it during seasonal closure periods, and to install barriers and signs along the route to eliminate trespass and vandalism to their properties from public wheeled motor vehicle use. The road segment across the properties will be classified as an NFS ML-5 road for public wheeled highway-licensed vehicle use only, which will allow the public to trailer OHVs to NFS lands and access Mud Lake road. The agreement for this public right-of-way is currently being finalized, and the improvements are expected to be complete during the 2008 field season.

Indicator Measure 2: In this Alternative, NFS and unauthorized routes within ½ mile of privately owned property with existing residences were initially removed. However, exceptions were made for specific NFS ML-2 roads and NFS motorized trails critical to the design of the Alternative, such as routes that serve as major connection points into the Forest, that create loop routes for OHV opportunities, that access a dispersed camping site, or that access unique features on the Forest. These routes should have limited impacts associated with having public wheeled motor vehicle use near privately owned property with existing residences and would allow quality motorized recreation opportunities to continue.

Indicator Measure 3: In this Alternative, 14 motorized NFS routes that connect to adjacent National Forest would be open for public wheeled motor vehicle use. Road 09N03 (Indian Valley 4WD) would be closed. This would allow travel between adjacent National Forests, but would reduce the number of connection points for public wheeled motor vehicle travel. This change is not expected to have a significant effect on public wheeled motor vehicle use.

Indicator Measure 4: Displacement of public wheeled motor vehicle use to adjacent lands is most likely correlated to the mileage of routes open for public wheeled motor vehicle use compared to routes open for public use in Alternative A. In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use, while Alternative B allows use on 1,847 miles of routes for public wheeled motor vehicles. This is a reduction of 13 miles. In addition to a reduction in mileage, there would also be a prohibition on public wheeled motor vehicle cross-country travel, a seasonal closure on all NFS ML-2 roads and NFS motorized trails for a period of 3 months, restrictions on wheeled OST, and restrictions on the distance public wheeled motor vehicles could travel to use areas for parking and dispersed camping (see the description of Alternative B in Chapter 2). These restrictions have the potential to displace use to adjacent lands. However, determining the magnitude of the impact created by displaced use on adjacent lands would be highly speculative.

Indicator Measure 5: In this Alternative, the only known direct effect to adjacent private resorts and cabins within the ENF boundary is around the Plasses Resort area near Silver Lake in Amador County. In the past, OHV riders (especially ATV users) have been able to use an unauthorized route that leaves Plasses Resort and heads west to connect to an approximately one mile road segment crossing the property of the six private landowners mentioned under ***Indicator Measure 1*** for this Alternative. This section of road has allowed OHV riders staged at Plasses Resort to connect to Mud Lake road (09N06) and the surrounding areas, which are popular for OHV use. However, this unauthorized route and road connection across private properties has resulted in conflicts between the public and the private landowners, vandalism and theft on the private properties, and noise and dust problems.

To reduce these problems, the Forest Service has worked with the private landowners to acquire a documented public right-of-way that will allow public highway-licensed wheeled motor vehicles to transport OHVs by trailer across the properties to access NFS lands and the Mud Lake road and surrounding areas. The agreement for this public right-of-way is currently being finalized, and the improvements mentioned in ***Indicator Measure 1*** for this Alternative are expected to be completed during the 2008 field season. However, the unauthorized route that leaves Plasses Resort will not be open for OHV use because it is within ½ mile of privately owned property with existing residences, and it will lead to a surfaced ML-5 road across private properties that will be open to public highway-licensed vehicles only, once the improvements are complete. It is illegal for OHVs to ride on surfaced roads that have not been designated for Mixed Use under California state traffic laws. This unauthorized route has been the only route out of Plasses Resort for ATVs to access NFS lands in the area. To reduce the impact to ATV users at Plasses Resort, there is a NFS motorized trail (17E19) that leaves Plasses Resort to the south to connect to NFS lands and the Mud Lake road and area. In the past, this route has been open for motorcycle use only. In this Alternative, 17E19 would be open for both ATV and motorcycle use to enable ATV and motorcycle users at the Resort to connect to NFS lands and the Mud Lake road and area, without having to trailer their OHVs across the private properties mentioned above. This would reduce the impacts to motorized users at the Resort, as well as the impacts to the private landowners. NFS trail 17E19 will need to be widened and rerouted in the future to better accommodate both vehicle classes. The NEPA analysis required to accomplish this construction will need to be done prior to performing this work.

Alternative Modified B

Indicator Measures 1 and 2: These measures are the same as for Alternative B.

Indicator Measure 3: In this Alternative, 13 motorized NFS routes that connect to adjacent National Forest would be open for public wheeled motor vehicle use. Road 09N03 (Indian Valley 4WD) and 14N39A (Richardson Spur) would be closed. This would allow travel between adjacent National Forests, but would reduce the number of connection points for public wheeled motor vehicle travel. This change is not expected to have a significant effect on public wheeled motor vehicle use.

Indicator Measure 4: Displacement of public wheeled motor vehicle use to adjacent lands is most likely correlated to the mileage of routes open for public wheeled motor vehicle use compared to routes open for public use in Alternative A. In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use, while Modified B allows use on 1,847 miles of routes for public wheeled motor vehicles. This is a reduction of 13 miles. In addition to a reduction in mileage, there would also be a prohibition on public wheeled motor vehicle cross-country travel, a seasonal closure on all NFS ML-2 roads and NFS motorized trails for a period of 3 months, restrictions on wheeled OST, and restrictions on the distance public wheeled motor vehicles could travel to use areas for parking and dispersed camping (see the description of Alternative Modified B in Chapter 2). These restrictions have the potential to displace use to adjacent lands. However, determining the magnitude of the impact created by displaced use on adjacent lands would be highly speculative.

Indicator Measure 5: In this Alternative, the only known direct effect to adjacent private resorts and cabins within the ENF boundary is around the Plasses Resort area near Silver Lake in Amador County. In the past, OHV riders (especially ATV users) have been able to use an unauthorized route that leaves Plasses Resort and heads west to connect to an approximately one mile road segment crossing the property of the six private landowners mentioned under ***Indicator Measure 1*** for this Alternative. This section of road has allowed OHV riders staged at Plasses Resort to connect to Mud Lake road (09N06) and the surrounding areas, which are popular for OHV use. However, this unauthorized route and road connection across private properties has resulted in conflicts between the public and the private landowners, vandalism and theft on the private properties, and noise and dust problems.

To reduce these problems, the Forest Service has worked with the private landowners to acquire a documented public right-of-way that will allow public highway-licensed wheeled motor vehicles to transport OHVs by trailer across the properties to access NFS lands and the Mud Lake road and surrounding areas. The agreement for this public right-of-way is currently being finalized, and the improvements mentioned in ***Indicator Measure 1*** for this Alternative are expected to be complete during the 2008 field season. However, the unauthorized route that leaves Plasses

Resort will not be open for OHV use because it is within ½ mile of privately owned property with existing residences, and it will lead to a surfaced ML-5 road across private properties that will be open to public highway-licensed vehicles only, once the improvements are complete. It is illegal for OHVs to ride on surfaced roads that have not been designated for Mixed Use under California state traffic laws. This unauthorized route has been the only route out of Plasses Resort for ATVs to access NFS lands in the area. In this Alternative, the only other OHV route out of Plasses Resort, NFS trail 17E19, would be open for motorcycle use only, rather than ATV and motorcycle use. As a result, ATV users at Plasses Resort would not have a direct exit point from the Resort to NFS lands in the surrounding area. The only option for ATV users to access NFS lands and the Mud Lake area and road from Plasses Resort would be to trailer their ATVs with highway-licensed vehicles across the private properties mentioned in ***Indictor Measure 5*** for Alternative B to unload on NFS lands adjacent to Mud Lake road and the surrounding area. This would be an inconvenience to ATV users at the Resort and may result in displacing these users to other areas on or off the Forest. This could have an effect on business at the Resort.

Motorcycles would continue to be able to access NFS lands from the Resort by using 17E19, and would not be directly impacted by this Alternative.

Alternative C

Indicator Measures 1 and 2: These measures are the same as for Alternative B.

Indicator Measure 3: In this Alternative, 14 motorized NFS routes that connect to adjacent National Forests would be open for public wheeled motor vehicle use. Road 14N39A (Richardson Spur) would be closed. This would allow travel between adjacent National Forests, but would reduce the number of connection points for public wheeled motor vehicle travel. This change is not expected to have a significant effect on public wheeled motor vehicle use.

Indicator Measure 4: Displacement of public wheeled motor vehicle use to adjacent lands is most likely correlated to the mileage of routes open for public wheeled motor vehicle use compared to routes open for public use in Alternative A. In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use, while Alternative C allows use on 1,730 miles of routes for public wheeled motor vehicles. This is a reduction of 130 miles. In addition to a reduction in mileage, there would also be a prohibition on public wheeled motor vehicle cross-country travel, a seasonal closure on all NFS ML-2 roads and NFS motorized trails for a period of 6 months, restrictions on wheeled OST, and restrictions on the distance public wheeled motor vehicles could travel to use areas for parking and dispersed camping (see the description of Alternative C in Chapter 2). These restrictions have the potential to displace use to adjacent lands. However, determining the magnitude of the impact created by displaced use on adjacent lands would be highly speculative.

Indicator Measure 5: In this Alternative, the only known direct effect to adjacent private resorts and cabins within the ENF boundary is around the Plasses Resort area near Silver Lake in Amador County. In the past, OHV riders (especially ATV users) have been able to use an unauthorized route that leaves Plasses Resort and heads west to connect to an approximately one mile road segment crossing the property of the six private landowners mentioned under ***Indicator Measure 1*** for this Alternative. This section of road has allowed OHV riders staged at Plasses Resort to connect to Mud Lake road (09N06) and the surrounding areas, which are popular for OHV use. However, this unauthorized route and road connection across private properties has resulted in conflicts between the public and the private landowners, vandalism and theft on the private properties, and noise and dust problems.

To reduce these problems, the Forest Service has worked with the private landowners to acquire a documented public right-of-way that will allow public highway-licensed wheeled motor vehicles to transport OHVs by trailer across the properties to access NFS lands and the Mud Lake road and surrounding areas. The agreement for this public right-of-way is currently being finalized, and the improvements mentioned in ***Indicator Measure 1*** for this Alternative are expected to be complete during the 2008 field season. However, the unauthorized route that leaves Plasses Resort will not be open for OHV use because it is within ½ mile of privately owned property with existing residences, and it will lead to a surfaced ML-5 road across private properties that will be open to public highway-licensed vehicles only, once the improvements are complete. It is illegal for OHVs to ride on surfaced roads that have not been designated for Mixed Use under California state traffic laws. This unauthorized route has been the only route out of Plasses Resort for ATVs to access NFS lands in the area. In this Alternative, the only other OHV route out of Plasses Resort, NFS trail 17E19, would not be open for public wheeled motor vehicle use as a result of resource concerns associated with the route crossing meadow areas, which is inconsistent with ENF LRMP standards and guidelines (see Chapter 1). As a result, there would be no routes open for public wheeled motor vehicle use leaving Plasses Resort to connect to NFS lands.

The only option for OHVs to access NFS lands and the Mud Lake area and road from Plasses Resort would be to trailer their OHVs with highway-licensed vehicles across the private properties mentioned in ***Indictor Measure 5*** for Alternative B to unload on NFS lands adjacent to Mud Lake road and the surrounding area. This would be an inconvenience to OHV users at the Resort and may result in displacing these users to other areas on or off the Forest. This could have an effect on business at the Resort.

Alternative D

Indicator Measures 1 and 2: These measures are the same as for Alternative B.

Indicator Measure 3: In this Alternative, 13 motorized NFS routes that connect to adjacent National Forest would be open for public wheeled motor vehicle use. Road 09N03 (Indian Valley 4WD) and 14N39A (Richardson Spur) would be closed. This would allow travel between adjacent National Forests, but would reduce the number of connection points for public wheeled motor vehicle travel. This change is not expected to have a significant effect on public wheeled motor vehicle use.

Indicator Measure 4: Displacement of public wheeled motor vehicle use to adjacent lands is most likely correlated to the mileage of routes open for public wheeled motor vehicle use compared to routes open for public use in Alternative A. In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use, while Alternative D allows use on 1,548 miles of routes for public wheeled motor vehicles. This is a reduction of 312 miles. In addition to a reduction in mileage, there would also be a prohibition on public wheeled motor vehicle cross-country travel, a seasonal closure on all NFS ML-2 roads and NFS motorized trails for a period of 5 months, restrictions on wheeled OST, and restrictions on the distance public wheeled motor vehicles could use areas for parking and dispersed camping (see the description of Alternative D in Chapter 2). These restrictions have the potential to displace use to adjacent lands. However, determining the magnitude of the impact created by displaced use on adjacent lands would be highly speculative.

Indicator Measure 5: In this Alternative, the only known direct effect to adjacent private resorts and cabins within the ENF boundary is around the Plasses Resort area near Silver Lake in Amador County. In the past, OHV riders (especially ATV users) have been able to use an unauthorized route that leaves Plasses Resort and heads west to connect to an approximately one mile road segment crossing the property of the six private landowners mentioned under ***Indicator Measure 1*** for this Alternative. This section of road has allowed OHV riders staged at Plasses Resort to connect to Mud Lake road (09N06) and the surrounding areas, which are popular for

OHV use. However, this unauthorized route and road connection across private properties has resulted in conflicts between the public and the private landowners, vandalism and theft on the private properties, and noise and dust problems.

To reduce these problems, the Forest Service has worked with the private landowners to acquire a documented public right-of-way that will allow public highway-licensed wheeled motor vehicles to transport OHVs by trailer across the properties to access NFS lands and the Mud Lake road and surrounding areas. The agreement for this public right-of-way is currently being finalized, and the improvements mentioned in ***Indicator Measure 1*** for this Alternative are expected to be complete during the 2008 field season. However, the unauthorized route that leaves Plasses Resort will not be open for OHV use because it is within ½ mile of privately owned property with existing residences, and it will lead to a surfaced ML-5 road across private properties that will be open to public highway-licensed vehicles only, once the improvements are complete. It is illegal for OHVs to ride on surfaced roads that have not been designated for Mixed Use under California state traffic laws. This unauthorized route has been the only route out of Plasses Resort for ATVs to access NFS lands in the area. In this Alternative, the only other OHV route out of Plasses Resort, NFS trail 17E19, would be open for motorcycle use only, rather than ATV and motorcycle use. As a result, ATV users at Plasses Resort would not have a direct exit point from the Resort to NFS lands in the surrounding area. The only option for ATV users to access NFS lands and the Mud Lake area and road from Plasses Resort would be to trailer their ATVs with highway-licensed vehicles across the private properties mentioned in ***Indictor Measure 5*** for Alternative B to unload on NFS lands adjacent to Mud Lake road and the surrounding area. This would be an inconvenience to ATV users at the Resort and may result in displacing these users to other areas on or off the Forest. This could have an effect on business at the Resort.

Motorcycles would continue to be able to access NFS lands from the Resort by using 17E19, and would not be directly impacted by this Alternative.

Alternative E

Indicator Measures 1 and 2: These measures are the same as for Alternative B.

Indicator Measure 3: In this Alternative, 11 motorized NFS routes that connect to adjacent National Forest would be open for public wheeled motor vehicle use. Road 09N03 (Indian Valley 4WD), Road 09N83 (Deer Valley), 14N39 (Richardson Lake 4WD) and 14N39A (Richardson Spur) would be closed. This would allow travel between adjacent National Forests, but would reduce the number of connection points for public wheeled motor vehicle travel. This change is not expected to have a significant effect on public wheeled motor vehicle use.

Indicator Measure 4: Displacement of public wheeled motor vehicle use to adjacent lands is most likely correlated to the mileage of routes open for public wheeled motor vehicle use compared to routes open for public use in Alternative A. In Alternative A, 1,860 miles of routes are currently open for public wheeled motor vehicle use, while Alternative E allows use on 1,330 miles of routes for public wheeled motor vehicles. This is a reduction of 530 miles. In addition to a reduction in mileage, there would also be a prohibition on public wheeled motor vehicle cross-country travel, a seasonal closure on all NFS ML-2 roads and NFS motorized trails for a period of 3 months, restrictions on wheeled OST, and restrictions on the distance public wheeled motor vehicles could travel to use areas for parking and dispersed camping (see the description of Alternative E in Chapter 2). These restrictions have the potential to displace use to adjacent lands. However, determining the magnitude of the impact created by displaced use on adjacent lands would be highly speculative.

Indicator Measure 5: Same as Alternative C.

O. Inventoried Roadless Areas

Affected Environment

There are nine inventoried roadless areas within the ENF, comprising a total of 71,999 acres, as determined through the Roadless Area Review Evaluation (RARE II) conducted in 1979, and subsequently modified in the 2000 Roadless Area Conservation FEIS (USDA FS 2000). Of these nine areas, the Caples Creek Roadless Area was established as a “further planning area” under the 1984 California Wilderness Bill. The remaining areas were assigned specific management direction through the ENF LRMP (Map 5).

Management direction within these areas ranges from *Semiprimitive Non-motorized* management to *general forest*. Subsequent Forest Service direction has called for limitations on road construction and reconstruction within Inventoried Roadless Areas (IRAs), including those areas where management direction would otherwise allow for road construction or reconstruction. On January 12, 2001, the Forest Service issued regulations pertaining to road construction and reconstruction within IRAs (36 CFR 294, Subpart B). The regulations at 36 CFR 294, Subpart B, prohibit the construction or reconstruction of roads in IRAs (with some exceptions), but do not preclude the continued use of existing NFS roads or NFS motorized trails. Under these regulations, the definition of road construction is an “activity that results in the addition of forest classified or temporary road miles” (36 CFR 294.11). Using this definition, adding existing unauthorized routes into the forest transportation system as NFS roads is considered road construction. These rules were replaced in 2003, but were subsequently reinstated by a United States District Court decision, dated September 19, 2006.

Forest Service direction for management of IRAs is to provide lasting protection for the IRAs, through the implementation of the regulations at 36 CFR 294. In particular, the regulations are designed to maintain the roadless characteristics of the IRAs, as set forth in the regulations. These characteristics include: (1) high quality or undisturbed soil, water, and air; (2) sources of public drinking water; (3) diversity of plant and animal communities; (4) habitat for threatened, endangered, proposed, candidate, and sensitive species and for those species dependent on large, undisturbed areas of land; (5) primitive, semi-primitive non-motorized, and semi-primitive motorized classes of dispersed recreation; (6) reference landscapes; (7) natural appearing landscapes with high scenic quality; (8) traditional cultural properties and sacred sites; and (9) other locally identified unique characteristics. These IRAs also serve as bulwarks against the spread of non-native invasive plant species (USDA FS, 2000).

Table 3-O.1 displays the number of miles of existing roads and motorized trails within each of the nine IRAs within the ENF. That portion of the Caples Creek IRA recommended in the ENF LRMP for Wilderness designation is not included in the table below, but rather is addressed in the Wilderness Section of this Chapter. Portions of Raymond Peak, Salt Springs, and Tragedy-Elephants Back IRAs were added to the Mokelumne Wilderness in the 1984 California Wilderness Act, and so these acres are also not shown in the table below.

Table 3-O.1: Roads and Trails within ENF IRAs

IRA Name	Acreage	Miles of NFS Roads	Miles of NFS Motorized Trails	Miles of Unauthorized Motorized Routes
Caples Creek (#027)	4,788	3.4	3.1	1.7
Dardanelles (#982)	8,114	0.0	3.6	6.8
Fawn Lake (#028)	1,160	0	0	1.0
Poison Hole (#025)	2,754	0	0	0
Pyramid (#023)	25,438	6.4	0	3.2
Raymond Peak (#985)	3,465	2.2	0	1.1
Rubicon (#026)	4,874	0	0	0
Salt Springs (#024)	133	0	0	0
Tragedy-Elephants Back (#984)	21,273	11.4	9.0	1.6
TOTAL	71,999	23.4	15.7	15.4

Of the miles of NFS roads and trails, and unauthorized routes, the majority occurs along the margins of the individual IRAs, except for several specific instances shown in Table 3-O.2.

Table 3-O.2: Routes within IRAs

IRA	NFS Road bisecting IRA or within the Center of IRA	NFS Trail bisecting IRA or within the Center of IRA	Unauthorized Route bisecting IRA or within the Center of IRA
Caples Creek	Mule Canyon Road (10N14) and Spur Bee road (10N14B)	Buck Pasture Trail (17E17)	A non-NFS route extending north from 10N14B
Dardanelles		Little Round Top Trail (17E16)	Picket Fence Trail (non-NFS trail)
Pyramid	Barrett Lake 4WD Road (11N26F)		
Raymond Peak	Deer Valley 4WD Road (9N83)		Little Indian Valley (non-NFS route) and spur roads off Deer Valley 4WD route
Tragedy-Elephants Back	Squaw Ridge 4WD Road (9N82)(along the boundary between Mokelumne Wilderness and the IRA), Mud Lake 4WD Road (9N04)	Horse Canyon Trail (17E21), Long Valley Trail (17E28), and Allen Camp Trail (17E19)	Other non-NFS trails near Long Valley Trail (17E28)

Analysis Framework

Introduction

The analysis focuses on the roadless characteristics defined in the regulations and those listed above. Roads in the forested Sierra Nevada may lead to increased runoff and potentially increased erosion and reduction in water quality. Erosion from roadbeds of native surface roads may be significant and further contribute to sedimentation in stream channels (Kattelmann 1996). Roads may also lead to impacts to riparian habitat from vegetation loss, stream channel alteration, changes in surface and subsurface hydrology, increases in water temperature, and fragmentation of riparian vegetation (Kattelmann and Embury 1996). Motor vehicle use of native surface roads further contributes to soil and water disturbance in forested environments through erosion and tire throw (Sack and da Luz 2003). These effects are further described in the Watershed section earlier in this Chapter.

Habitat fragmentation results when relatively continuous habitat is divided into smaller disconnected parcels by roads or other human-made barriers. While native surface roads are often less heavily traveled than surfaced roads, studies demonstrate that they can have detrimental effects on wildlife movements and habitat integrity (Crist and Gehrke 1995). In particular, fragmentation can lead to decreased habitat connectivity, changes in microclimate, increases in human-caused fires, and invasion of non-native species (USDA FS 2000). As described in the Wildlife section earlier in Chapter 3, the continuity of old growth forest habitat (defined as CWHR classes 5M, 5D, and all 4D that is adjacent to 5M or 5D stands) is disrupted by roads and trails, and those effects extend beyond the immediate road or trail prism. The species that use or are dependent on old growth forest habitat are sensitive to habitat fragmentation and disturbance.

The only IRA with known occurrences of invasive exotic plants is the eastern portion of the Rubicon IRA, immediately along NFS Road 14N08. Skeletonweed (*Chondrilla juncea*), Scotch broom (*Cytisus scoparius*), tall whitetop (*Lepidium latifolium*), and medusahead (*Taeniatherum caput-medusae*) have been found along this road which forms the easternmost boundary of this IRA. There are known occurrences of invasive exotic species along Highway 50 in the general vicinity of Pyramid IRA and along Highway 88 in the vicinity of Tragedy-Elephants Back IRA, however, there are no known occurrences within these IRAs. In general, the invasive exotic plant species present on the ENF pose less of a threat in the higher elevations of the Forest, where the majority of the IRAs are found. These effects are further described in the Invasive Exotic Plants Section in this Chapter.

Data

Table 3-O.3 displays the number of miles of roads or trails that would be open for various types of public wheeled motor vehicle use in each of the Alternatives considered in detail. Semi-primitive motorized recreation is one of the dispersed recreation opportunities which inventoried roadless areas provide, along with primitive and semi-primitive non-motorized recreation. The table differentiates between NFS roads or trails and unauthorized routes.

Table 3-O.3: Use of routes

IRA Name	USE	Alternative A [1/]	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
Caples Creek	NFS roads	3.4 (all uses)	0.7 (all uses)	0.7 (all uses)	0.7 (all uses)	0.7 (all uses)	0
	NFS motorized trails	3.1 (MC)	2.1 (high clearance vehicles), 3.6 (MC)	1.8 (high clearance vehicles), 3.6 (MC)	2.1 (high clearance vehicles), 3.6 (MC)	2.1 (high clearance vehicles), 3.6 (MC)	0
	Unauthorized routes to be added as NFS motorized trails	1.7± (all uses)	0.5 (high clearance vehicles)	0.5 (high clearance vehicles)	0.5 (high clearance vehicles)	0.5 (high clearance vehicles)	0
Dardanelles	NFS roads	0	0	0	0	0	0
	NFS motorized trails	3.6 (MC)	3.4 (MC)	3.4 (MC)	0	1.0 (MC)	0
	Unauthorized routes to be added as NFS motorized trails	6.8± (MC)	0	0	0	0	0
Fawn Lake	NFS roads	0	0	0	0	0	0
	NFS motorized trails	0	0	0	0	0	0
	Unauthorized routes to be added as NFS motorized trails	1.0± (all uses)	0	0	0	0	0
Poison Hole	NFS roads	0	0	0	0	0	0
	NFS motorized trails	0	0	0	0	0	0
	Unauthorized routes to be added as NFS motorized trails	0	0	0	0	0	0
Pyramid	NFS roads	6.4 (all uses)	1.1 (street-legal only)	1.0 (all uses), 0.1 (street-legal only)	1.1 (street-legal only)	1.1 (street-legal only)	0
	NFS motorized trails	0	5.3 (high	5.3 (high	5.3 (high	5.3 (high	0

IRA Name	USE	Alternative A [1/]	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
			clearance vehicles)	clearance vehicles)	clearance vehicles)	clearance vehicles)	
	Unauthorized routes to be added as NFS motorized trails	2.7± (all uses), 0.5 (MC)	0	0	0	0	0
Raymond Peak	NFS roads	2.2 (all uses)	0	0	0	0	0
	NFS motorized trails	0	2.2 (high clearance vehicles)	2.2 (high clearance vehicles)	2.2 (high clearance vehicles)	2.2 (high clearance vehicles)	0
	Unauthorized routes to be added as NFS motorized trails	1.1± (all uses)	0.6 (high clearance vehicles)	0.1 (high clearance vehicles)	0	0.1 (high clearance vehicles)	0
Rubicon	NFS roads	0	0	0	0	0	0
	NFS motorized trails	0	0	0	0	0	0
	Unauthorized routes to be added as NFS motorized trails	0	0	0	0	0	0
Salt Springs	NFS roads	0	0	0	0	0	0
	NFS motorized trails	0	0	0	0	0	0
	Unauthorized routes to be added as NFS motorized trails	0	0	0	0	0	0
Tragedy-Elephants Back (There is an additional 5.1 miles of trail	NFS roads	11.4 (all uses)	9.8 (all uses)	9.8 (all uses)	9.8 (all uses)	11.4 (all uses)	0
	NFS motorized trails	9.0 (MC).	1.6 (high clearance vehicles), 7.2 (MC). 1.8 (ATV/MC)	1.6 (high clearance vehicles), 9.0 (MC).	1.6 (high clearance vehicles)	9.0 (MC).	0

IRA Name	USE	Alternative A [1/]	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
that is coincident with roads)	Unauthorized routes to be added as NFS motorized trails	0.4± (all uses), 1.2± (MC)	0	0	0	0	0
TOTAL MILES	NFS roads	23.4 (all uses)	10.5 (all uses), 1.1 (street-legal only)	11.5 (all uses), 0.1 (street-legal only)	10.5 (all uses), 1.1 (street-legal only)	12.1 (all uses), 1.1 (street-legal only)	0
	NFS motorized trails	15.7 (MC)	11.2 (high clearance vehicles), 14.2 (MC), 1.8 (ATV/MC)	10.9 (high clearance vehicles), 16.0 (MC)	11.2 (high clearance vehicles), 3.6 (MC)	9.6 (high clearance vehicles), 13.6 (MC)	0
	Unauthorized routes to be added as NFS motorized trails	6.9± (all uses), 8.5± (MC)	1.1 (high clearance vehicles)	0.6 (high clearance vehicles)	0.5 (high clearance vehicles)	0.6 (high clearance vehicles)	0

[1/] Since Alternative A is the No-Action Alternative, in this alternative the unauthorized routes will not be added as NFS motorized trails, but these unauthorized routes will continue to receive use. It is anticipated under the No Action alternative that additional unauthorized routes may develop over time without X-C prohibition..

As a means of displaying the differences in habitat fragmentation between the various alternatives, Table 3-O.4 shows the average size of old growth forest habitat patches that are undisrupted by roads or trails within each of the IRAs. For comparison purposes, this table also shows the average size of old growth forest habitat patches independent of whether they are disrupted by roads or trails, and the average size of patches undisrupted by NFS roads or trails. Additional explanation of the relationship between fragmentation of old growth forest habitat and road or trail designation can be found in the Wildlife section earlier in this Chapter.

Table 3-O.4: Average size of old growth forest habitat patches undisrupted by roads or trails within IRAs

IRA	Average Old Growth Forest Habitat Patch Size (acres)							
	Average patch size independent of presence of roads or trails	Average patch size based on existing NFS roads and trails only	Average patch size based on all routes designated for motorized use under Alternative					
			A	B	Mod B	C	D	E
Caples Creek	46.6	18.4	17.6	25.8	38.8	38.8	38.8	38.8
Dardanelles	53.3	32.5	25.4	32.5	32.5	39.1	34.4	39.1
Fawn Lake	30.1	30.1	30.1	30.1	30.1	30.1	30.1	30.1
Poison Hole	41.5	27.7	27.7	27.7	27.7	27.7	27.7	27.7
Pyramid	29.9	23.9	23.9	23.9	23.9	23.9	23.9	24.8
Raymond Peak	25.9	15.1	14.6	15.1	15.1	15.1	15.1	15.1
Rubicon	49.4	17.8	17.8	17.8	17.8	17.8	17.8	17.8
Salt Springs	21.9	15.7	15.7	15.7	15.7	15.7	15.7	15.7
Tragedy-Elephants Back	12.5	10	9.5	10	10	10	10	10

Indicator Measures

The following four indicator measures were used to display the differences between the Alternatives, with respect to effects on the "roadless character" (as defined above). Also, they represent the dominant characteristics described in the preamble to the Roadless Rule (USDA FS 2000).

Indicator Measure 1: Miles of road and trails open for public wheeled motor vehicle use to provide motorized recreation opportunities in IRAs.

Indicator Measure 2: The potential for the spread of non-native invasive plants based on the miles of roads and trails open to motor vehicle use,

Indicator Measure 3: The potential for impacts to water quality based on miles of roads and trails, and

Indicator Measure 4: Changes in old growth forest wildlife habitat fragmentation.

Environmental Consequences

Direct and Indirect Effects

Alternative A

Indicator Measure 1: In this alternative, current motorized use of existing NFS roads, NFS trails, and unauthorized routes would not be prohibited, nor would cross-country travel be prohibited. This alternative would have the highest opportunities for semi-primitive motorized recreation and would provide the most access for dispersed camping and other associated recreation (Table 3-O.3). However, there would continue to be conflicts between motorized and non-motorized recreationists due to vehicle noise and presence, and the least opportunities for undisturbed primitive (non-motorized) recreation.

Indicator Measures 2-4: This alternative would have the highest potential for impacts to the roadless character, due to continuation of the existing fragmented old growth forest habitat and the potential for further fragmentation from new routes that may develop. There would be a limited potential for the spread of non-native invasive plants by seed dispersal from wheeled motor vehicles based on the presence of known occurrences of non-native invasive plants and their slower spread at higher elevations. The Rubicon IRA is the only IRA with currently known occurrences of invasive exotic plants. There are no roads or trails within the Rubicon IRA which will allow motorized use, including in the vicinity of that portion of 14N08 where non-native invasive plants are known to occur. There would be a limited potential for continued impacts to water quality through erosion of road surfaces and subsequent sedimentation within stream channels.

Alternative B

Indicator Measure 1: In this alternative, existing NFS roads and NFS trails in IRAs would be open for public wheeled motor vehicle use, except a 0.1 mile segment of road in the northern portion of Caples Creek IRA and a 0.2 mile segment at the end of the Little Round Top trail (17E16) in the Dardanelles IRA. However, there will be some modifications or restrictions on vehicle types allowed and changes in the management of some roads as trails, as shown in Table 3-O.3. These routes have been used for motorized access and semiprimitive motorized recreation for many years. Managing some of these routes as trails will more appropriately reflect the type of use they receive and the desire to provide a semi-primitive motorized trail recreation opportunity.

The total miles of unauthorized routes that would have motorized use would decrease from 15.4 miles in Alternative A to 1.1 miles. These routes are primarily along the margins of the IRAs. These routes would be added to the Forest transportation system as NFS trails and would be managed for high clearance vehicles. Two routes occur in the eastern portion of the Raymond Peak IRA leading to popular dispersed camping areas in Little Indian Valley. The Deer Valley 4WD route (and existing NFS road) will be managed as a trail and one short access trail leading to dispersed camping areas along the Deer Valley 4WD Trail would be open as would a 0.5 mile access trail in the eastern portion of the Caples Creek IRA that accesses a popular dispersed camping area.

This alternative would provide less miles of motorized dispersed recreation opportunities than Alternative A. In particular, besides those routes described above, this Alternative would eliminate motorcycle riding opportunities along Picket Fence Ridge, within the Dardanelles IRA, and the 4WD connection between the Spur Bee road (10N14B) and 11N36A (near Strawberry Creek). However, some existing NFS roads would be managed as NFS motorized trails under this Alternative, including portions of the Mule Canyon road (10N14), the Spur Bee road (10N14B), the Barrett 4WD trail (11N26F), the Deer Valley 4WD road (9N83), portions of the Mud Lake road (9N04), and portions of the Squaw Ridge road (9N82). This reduction in motorized access will reduce motorized recreation opportunities, while improving some non-motorized dispersed opportunities as a result of decreased motor vehicle noise and presence.

Indicator Measures 2-4: This alternative would have less impact to the roadless character than Alternative A, through:

Slightly reduced impacts to water quality from reduced erosion of road surfaces and subsequent sedimentation within stream channels as route surfaces not open for use revegetate naturally,

Reduced fragmentation of old growth forest habitat patches and associated reduced impacts to old growth forest dependent wildlife species, and

Slightly reduced potential for the spread of non-native invasive plants by seed dispersal from vehicles. This alternative does not differ from Alternative A in regards to the Rubicon IRA.

Table 3-O.4 shows that for Alternative B, the average size of undisrupted old growth forest habitat patches would increase from 18.8 to 20.7 acres. The percent of area with a route density in excess of two miles per square mile within the IRAs would decrease from 14 percent in Alternative A to 7 percent of the total area (Table 3-O.5).

Modified B

Indicator Measure 1: In this alternative, existing NFS roads and NFS trails in IRAs would be open for public wheeled motor vehicle use, except as described in Alternative B, and so will have effects similar to those described for Alternative B. However, this Alternative differs from Alternative B in that all uses will be allowed on 1 mile of NFS road in the western portion of the Pyramid IRA and the Allen Camp trail (17E19) would be open for motorcycle use, but not for ATV use.

The total miles of unauthorized routes that would have continued motorized use would decrease from 15.4 miles in Alternative A to 0.6 miles. The effects would be somewhat less than in Alternative B. The access trail leading from the Deer Valley 4WD Trail to dispersed camping areas (0.1 mile) is restricted to areas outside of meadows. The two routes in the eastern portion of the Raymond Peak IRA leading to popular dispersed camping areas in Little Indian Valley would not be open to wheeled motor vehicles because they are in an area designated as a Critical Aquatic Refuge (see the Aquatic Wildlife section of this Chapter for more information).

This alternative would provide less miles of motorized dispersed recreation opportunities than Alternative A, and would be similar to Alternative B. However, in Modified B, there will be a loss of opportunity for ATV use within the Tragedy-Elephants Back IRA. The reduction in motorized access from Alternative A will improve some non-motorized dispersed opportunities over Alternative A, as a result of decreased motor vehicle noise and presence.

Indicator Measures 2-4: This alternative would have less impact to the roadless character than Alternative A, and similar impacts as Alternative B, through:

Slightly reduced impacts to water quality from reduced erosion of road surfaces and subsequent sedimentation within stream channels as route surfaces not open for use revegetate naturally,

Reduced fragmentation of old growth forest habitat patches and associated reduced impacts to old growth forest dependent wildlife species, and

Slightly reduced potential for the spread of non-native invasive plants by seed dispersal from vehicles. This alternative does not differ from Alternative A in regards to the Rubicon IRA.

Table 3-O.4 shows that for Modified B, the average size of undisrupted old growth forest habitat patches would increase from 18.8 in Alternative A to 21.8 acres. The percent of area with a route density in excess of two miles per square mile within the IRAs would decrease from 14 percent in Alternative A to 7 percent of the total area (Table 3-O.5).

Alternative C

Indicator Measure 1: In this alternative, there would be a reduction of 12.7 miles from Alternative A of the total miles of existing NFS roads and NFS trails that would be available for public wheeled motor vehicle use in IRAs, along with some restrictions on vehicle types (Table 3-O.3). The reduction is from not allowing use on 10N13B in the northern portion of Caples Creek IRA; Little Round Top (17E16) and Lover's Leap trails (17E12) in the Dardanelles IRA; and Horse Canyon (17E21), Long Valley (17E28), and Allen Camp (17E19) trails in the Tragedy-Elephants Back IRA. These changes in the type of use allowed would result in a loss of dispersed motorized recreation opportunities.

The total miles of unauthorized routes open for public wheeled motor vehicle use would decrease from 15.4 miles in Alternative A to 0.5 miles, consisting of an access trail to a dispersed camping area on the eastern edge of the Caples Creek IRA.

This Alternative would have similar effects on motorized recreation opportunities and non-motorized dispersed recreation opportunities as those described in Alternative B.

Indicator Measures 2-4: This Alternative would have less impact to the roadless character than Alternatives A and B, through:

Slightly reduced impacts to water quality from reduced erosion of road surfaces and subsequent sedimentation within stream channels as route surfaces not open for use revegetate naturally,

Reduced fragmentation of old growth forest habitat patches and associated reduced impacts to old growth forest dependent wildlife species, and

Slightly reduced potential for the spread of non-native invasive plants by seed dispersal from vehicles. This alternative does not differ from Alternative A in regards to the Rubicon IRA.

Table 3-O.4 shows that for Alternative C, the average size of undisrupted old growth forest habitat patches would increase from 18.8 in Alternative A to 22.1 acres. The percent of area with a route density in excess of two miles per square mile within the IRAs would decrease from 14 percent in Alternative A to 5 percent of the total area (Table 3-O.5).

Alternative D

Indicator Measure 1: This alternative would have effects similar to those described for Alternative B, except that public wheeled motor vehicle use would not be allowed on the entire Little Round Top trail (17E16) in the Dardanelles IRA, or on the roads into Little Indian Valley in the Raymond Peak IRA. As in Alternative B, there would be some modifications or restrictions on vehicle types allowed and changes in the management of some roads as trails as shown in Table 3-O.3. The differences from Alternative B are that Allen Camp trail (17E19) would be open for motorcycle use, but not for ATV use and the Mud Lake road (17E28) would be open as a road, not a trail.

The total miles of unauthorized roads available for public wheeled motor vehicle use would decrease from 15.4 miles in Alternative A to 0.6 miles. These routes include the 0.5 mile access trail to dispersed camping on the eastern margin of the Caples Creek IRA and the 0.1 mile access trail to dispersed camping along the Deer Valley 4WD Trail (9N83) in the Raymond Peak IRA.

This alternative would have similar effects on motorized recreation and non-motorized dispersed recreation opportunities as those described in Alternative B.

Indicator Measures 2-4: This alternative would have fewer impacts to the roadless character than Alternative A through:

Slightly reduced impacts to water quality from reduced erosion of road surfaces and subsequent sedimentation within stream channels as route surfaces not open for use revegetate naturally,

Reduced fragmentation of old growth forest habitat patches and associated reduced impacts to old growth forest dependent wildlife species, and

Slightly reduced potential for the spread of non-native invasive plants by seed dispersal from vehicles. This alternative does not differ from Alternative A in regards to the Rubicon IRA.

Table 3-O.4 shows that for Alternative D, the average size of undisrupted old growth forest habitat patches would increase from 18.8 in Alternative A to 21.9 acres. The percent of area with a route density in excess of two miles per square mile within the IRAs would decrease from 14 percent in Alternative A to 6 percent of the total area (Table 3-O.5).

Alternative E

Indicator Measure 1: In this alternative, none of the NFS roads or trails within any of the IRAs would be open, leading to a reduction of 39.1 miles from Alternative A of existing NFS roads and NFS trails that would be open to public wheeled motor vehicle use (see Table 3-O.3). Use would not be allowed on any of the unauthorized routes, leading to a decrease of 15.4 miles from Alternative A.

The elimination of all motorized use in IRAs will have a significant adverse effect on semiprimitive motorized recreation opportunities on the Forest. However, it will greatly improve non-motorized dispersed opportunities as a result of no motor vehicle noise or presence.

Indicator Measures 2-4: This alternative would provide the greatest protection to the roadless character of the IRAs through:

Reduced impacts to water quality through erosion of road surfaces and subsequent sedimentation within stream channels as route surfaces not open for use are restored or naturally revegetate,

Reduced fragmentation of old growth forest habitat patches and associated reduced impacts to old growth forest dependent wildlife species, and

Reduced potential for the spread of nonnative invasive plants by seed dispersal from vehicles,

Table 3-O.4 shows that for Alternative E, the average size of undisrupted old growth forest habitat patches would increase from 18.8 in Alternative A to 22.2 acres. The percent of area with a route density in excess of two miles per square mile within the IRAs would decrease from 14 percent in Alternative A to 2 percent of the total area (Table 3-O.5).

Cumulative Effects for All Alternatives

Spatial Scale

The geographic scope of the cumulative effects analysis was limited to the IRAs within the ENF since the effects are measured within the IRAs.

Analysis

The cumulative effects analysis for IRAs considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: road construction and timber harvesting within IRAs. The greatest potential threats to maintaining the roadless characteristics, as described in the federal regulations, are from road construction, reconstruction, and timber harvesting within IRAs (USDA Forest Service 2000). Under all of the alternatives, no new road construction is proposed in any of the IRAs.

Timber harvesting within IRAs on the ENF in the last 10 years has been limited to management activities on 132 acres along the margins of the Pyramid IRA (IRA total acreage of 25,438 acres). These activities consisted of 76 acres of commercial thinning conducted between 1997 and 2001 (before the implementation of the current regulations) and 11 acres of pre-commercial thinning between 1999 and 2001, and then 22 acres during 2006 (during the period when the current regulations were not in effect). No timber harvesting was conducted during the past 10 years in any of the other IRAs.

The effects from treatment of these areas were evaluated in various environmental analyses prior to treatment activities. These vegetation management activities cumulatively reduced the quality of the roadless character, but only to a limited extent, based on the location of the treatments, minor change in the vegetation structure, and limited fragmentation of wildlife habitat.

P. Wild & Scenic Rivers

Affected Environment

The ENF does not have any existing designated Wild and Scenic Rivers (W&SRs) within its boundary, or any study rivers that were specifically listed in the W&SR Act. There are, however, a number of river segments that were determined by the Forest Service as eligible, suitable, and/or recommended for W&SR designation, as shown in Table 3-P.1. See Map 6 for the locations. Specific direction for the designation and management of W&SRs is given in the Wild and Scenic Rivers Act and in the FSM and FSH.

Portions of the North Fork of the Mokelumne River, the Rubicon River, and the North and Middle Forks of the Cosumnes River within the ENF appear on the National Rivers Inventory (see Table 3-P.1). The National Rivers Inventory, maintained by the National Park Service, was developed in response to direction in the W&SR Act and provides baseline information on the condition and extent of free flowing rivers. These river segments are to be protected until designated or released from consideration.

The Rubicon River, below Hell Hole Dam and above its confluence with the Middle Fork American River, has been recommended for W&SR designation through the ENF LRMP (as modified through the Chief of the Forest Service July 16, 1991, Decision on appeals of the ENF LRMP; USDA FS. 1991). Within the lower portion of the Recommended Wild River segment, near the confluence with the Middle Fork American River, there is one existing NFS road segment totaling 1.5 miles in length. There are 10.1 miles of NFS motorized trail within this recommended Scenic river corridor. The Mokelumne River, for 18 miles above Salt Springs Reservoir, has been recommended for Wild River designation, whereas the 6.5 mile segment of river below Salt Spring Reservoir has been recommended for Recreation River designation. The segment above Salt Springs Reservoir is within the Mokelumne Wilderness and there are no roads or motorized trails within the corridor.

As shown in Table 3-P.1, there are a number of other river segments that have been found to be eligible or suitable for W&SR designation. Of these river segments, the only segments found to be eligible or suitable for Wild River designation are a portion of Pyramid Creek north of Highway 50 (a portion of which is within Desolation Wilderness) and the segment of Caples Creek within the recommended Caples Creek Wilderness (recommended in the ENF LRMP, p. 4-122). There are no motorized roads or trails within the eligible corridor associated with Pyramid Creek. There are 4.9 miles of NFS motorized trail within the Caples Creek eligible segment and an additional 0.6 miles of unauthorized route within this corridor. These trails cross Caples Creek in three locations, one of which includes a bridge spanning Caples Creek where NFS motorized trail 17E20 crosses the stream. The remaining river segments have been found to be eligible or suitable as Recreation Rivers. Many of these do include roads and trails that provide public wheeled motor vehicle access.

Table 3-P.1: Potential Wild and Scenic Rivers on the ENF

Name	Location	Classification				Status				Motorized Roads or Trails
		Wild	Scenic	Recrea-tion	Outstandingly Remarkable Values	Eligible Y/N	Suitable Y/N	Recom-mended Y/N	NRI Y/N	
North Fork Mokelumne River	Above Salt Spring Res.	X			Scenery, Fisheries			Y	Y	None
	Salt Springs Res. to 1 mile west of Bear R.			X	Historical/ Cultural		Y	Y	Y	8N50 (ML4) = 5.5 mi
	1 mile west of Bear R. to Tiger Creek Res.	X			Historical/ Cultural		N		Y	None
Bear River	Area within Mokelumne Canyon SIA			X	Historical/ Cultural	Y				Several ML 1-4 system roads and one non-NFS road
Beaver Creek	Area within Mokelumne Canyon SIA			X	Historical/ Cultural	Y				Portions of two ML 4 system roads
Cole Creek	Area within Mokelumne Canyon SIA			X	Historical/ Cultural	Y				Several ML1-4 system roads and non-NFS routes
Green Creek	Area within Mokelumne Canyon SIA			X	Historical/ Cultural	Y				Portions of 8N50 (ML 4), 7N01 (ML 3), and 7N03 (ML 2)
Summit City Creek	Source to confluence w/NF Mokelumne	X			Recreation, Scenic	Y				None
South Fork American River	Source to Blair Bridge			X	Recreation, Historical/ Cultural	Y				Numerous ML 1-5 System roads and some non-NFS roads and trails
	Blair Bridge to Slab Creek Reservoir				None	N				None

Silver Fork American River	Confluence w/S.F. American R. to Caples Cr.			X	Recreation	Y				Numerous ML 1-4 NFS roads, a portion of motorized trail 17E51 and some non-NFS roads and trials
Pyramid Creek	6200' Elev. To Avalanche Lake	X			Scenery, Recreation, Geology	Y				None
	Hwy. 50 north to 6200' Elev			X	Recreation, Geology	Y				ML-5 NFS Road 11N14 and one short non-NFS road accessing recreation residences
Caples Creek & unnamed tributary	Proposed Caples Creek Wilderness boundary to confluence w/Silver Fork American R.	X			Recreation, Fisheries					17E51 1.7 mi; 17E71 = 1.2 mi; 17E20 = 0.6 mi; 17E52 = 0.3 mi; non-NFS trail = 0.5 mi
Middle Fork American R.	Oxbow Res. to Auburn			X	Recreation, Historical/ Cultural		Y			NFS ML-2 roads 13N55 and 14N35A
North Fork Cosumnes River	Source to confluence w/main stem Cosumnes R.			X	Recreation, Free-flowing Water	Y			Y	Numerous ML 1-4 NFS roads and some non-NFS roads and trails
Middle Fork Cosumnes River	Source to confluence w/main stem Cosumnes R.			X	Recreation, Free-flowing Water	Y			Y	Numerous ML 1-4 NFS roads, segments of motorized trails in the Gold Note trail system, and some non-NFS roads and trails
Rubicon River	Hell Hole Dam to Below Ellicotts Bridge		X		Fisheries			Y	Y	Hunter Trail (14E09) = 8.5 mi, Deer Creek (14E11) and Hales Crossing (14E04) = 1.6 mi. of NFS trails and 0.6 mi. of non-NFS road and trail north of Ellicotts Bridge.
	Ellicotts Bridge to Above Oxbow Res.	X			Fisheries			Y	Y	14N25G (ML-2) = 1.3 mi

	Just upstream from Oxbow Reservoir		X		Fisheries			Y	Y	14N25 (ML4) = 2.0 mi (street legal vehicles only)
Upper Rubicon River	Clyde Lake to Rubicon Res.	?			Recreation	Y				None
	Rubicon Res. to Hell Hole Res.				None	?				None
South Fork Rubicon River	No description found				None	N				None
Bear Creek	Shoemaker Hill to Rock Creek				None	N				None

1NRI = National Rivers Inventory, maintained by NPS

Analysis Framework

Data & Assumptions

For a discussion of the data and assumptions used in this analysis refer to the beginning of Chapter 3.

Indicator Measures

To display the differences between the direct and indirect effects of the alternatives to W&SRs on the ENF, the following indicator measures were used:

Indicator Measure 1: Miles of roads and/or trails designated for public wheeled motor vehicle use within eligible or recommended Wild River Segments, as Forest Service policy for these river segments is that the unique characteristics of these corridors are to be protected until designated. Normally no motorized travel is allowed within designated wild river corridors.

Indicator Measure 2: Miles of roads and/or trails designated for public wheeled motor vehicle use within eligible or recommended Scenic River Segments, as Forest Service policy for these river segments is that they should not include long stretches of conspicuous and well-traveled roads closely paralleling the riverbank,

Indicator Measure 3: Miles of roads and/or trails designated for public wheeled motor vehicle use within eligible or recommended Recreation River Segments, in order to allow public access to these river segments, and

Indicator Measure 4: The effects to the Outstandingly Remarkable Values which a river segment possesses, and by Forest Service policy, should be protected.

Table 3-P.2: Miles of roads or trails open for wheeled motor vehicle use within eligible and/or recommended Wild and Scenic River segments

Alternative	Road or Trail	Miles of Roads or Trails Open for Motorized Use			
		Rubicon Wild Segment	Rubicon Scenic Segment	Caples Creek Wild Segment	Total Miles
A	NFS Road	1.5	0.3	0	1.8
	NFS Trail	0	10.4	5.5	15.9
B	NFS Road	0	0.2	0	0.2
	NFS Trail	0	12.6	2.5	15.1
Mod B	NFS Road	0	0.2	0	0.2
	NFS Trail	0	10.1	0	10.1
C	NFS Road	0	0.2	0	0.2
	NFS Trail	0	0	0	0
D	NFS Road	0	0.2	0	0.2
	NFS Trail	0	5.6	0	5.6
E	NFS Road	0	0.2	0	0.2
	NFS Trail	0	8.8	0	8.8

Environmental Consequences

Direct and Indirect Effects

Alternative A

Indicator Measure 1: Under this Alternative, current motorcycle use of 4.9 miles of NFS motorized trails would be allowed within the eligible Wild segment of Caples Creek (see Table 3-P.2), including two crossings of Caples Creek. Current motorcycle use of 0.6 miles of an unauthorized route would be allowed including one stream crossing near Government Meadow. In addition, current motorized use of 1.5 miles of NFS ML-2 road 14N25G would be allowed within the Recommended Wild segment of the Rubicon River upstream from its confluence with the Middle Fork American River. This road extends to within about 1,000 feet of the northern bank of the river and does not cross the river. This road provides access to NFS non-motorized trail 12E11.

These motorized uses within these river segments are inconsistent with ENF LRMP direction for Wild River segments (Management Practice 28 for Management Area 2).

Indicator Measure 2: Current motorcycle use of 10.1 miles of NFS motorized trails would be allowed within the Scenic segment of the Rubicon River, between Ellicott’s bridge and Hell Hole Reservoir. Current motorized use of 0.3 miles of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River providing access to dispersed camping would be allowed. Current motorcycle use of an additional 0.3 miles of unauthorized trail in the same area would also be allowed. These motorized uses are allowable within the Scenic river segment, provided they do not degrade the outstandingly remarkable value of the river segment.

Indicator Measure 3: There is no change to public access available to those river and stream segments eligible for Recreation classification, as shown in Table 3-P.1. This access will allow for public enjoyment of these river and stream segments.

Indicator Measure 4: The Outstandingly Remarkable Values for which the Rubicon Scenic River segment is recognized is its fisheries resource, including the good coldwater trout population and designation as a California Wild Trout Stream (ENF LRMP, 1989, LRMP EIS Appendix E, page E-67 and the National Rivers Inventory). Motorized use in the Scenic River segment for this alternative is acceptable, based on ENF LRMP Management Practice 27 in Management Area 2, p. 4-132. The presence of the trails and the associated motorized use on these trails was recognized in the 1991 Forest Service appeal decision relating to the classification of this river segment, and as such, the agency has determined that this use is not inconsistent with the classification (USDA FS. 1991).

The trails within the Caples Creek W&SR corridor have the potential to affect habitat capability for trout and could affect the natural reproduction of trout, thereby adversely affecting the fisheries resource, which is one of the Outstandingly Remarkable Values for this stream (for further information, see the Terrestrial and Aquatic Wildlife section of Chapter 3).

The various Outstandingly Remarkable Values that the other river or stream segments possess are shown in Table 3-P.1. There are no adverse effects to these Outstandingly Remarkable Values in this Alternative.

Alternative B

Indicator Measure 1: Under this Alternative, 2.5 miles of NFS motorized trail 17E51 would be open for motorcycle use only within the eligible Wild segment of Caples Creek. This trail does not cross Caples Creek. This would allow motorcyclists to traverse through this scenic area, while eliminating the multiple stream crossings and reducing the number of miles of NFS motorized trail within the eligible Wild River corridor.

Since the suitability study for the Caples Creek eligible segment has not been completed, Forest Service direction is to maintain the character of the inventoried segment at the most restrictive classification until the suitability study is completed. This motorized use within the stream segment is not degrading the character of the inventoried segment at this time, but has the potential to do so in the future. If this stream segment is designated for Wild classification in the future, motorized use would be inconsistent with management direction for Wild River segments at that time, including ENF LRMP Management Practice 28 in Management Area 2.

Public wheeled motor vehicle use would not be allowed on the portion of NFS ML-2 road 14N25G within the Wild segment of the Rubicon River in this alternative. Access to the river would be by non-motorized means only and would require traversing approximately 1.5 miles of very steep terrain.

Indicator Measure 2: Within the Scenic segment of the Rubicon River, 12.6 miles of NFS motorized trails would be open for motorcycle use only, between Ellicott's bridge and Hell Hole Reservoir, including the South Fork trail (not included in Alternative A). An additional 0.2 miles of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River near Ellicott's Bridge would be open for street-legal wheeled motor vehicle use only (see Table 3-P.2).

Indicator Measure 3: There would be general public access available to those river and stream segments eligible for Recreation classification; however, some specific roads will not be open for public wheeled motor vehicle use which will limit public access in those areas to non-motorized means.

Indicator Measure 4: As noted above, the Outstandingly Remarkable Values for which the Rubicon Scenic River segment is recognized is its fisheries resource, including the good coldwater trout population and designation as a California Wild Trout Stream (USDA FS. 1989,

Appendix E, and the NRI). The presence of the motorized trails and their associated OHV use was recognized in the 1991 Forest Service appeal decision relating to the classification of this river segment, and as such, the agency has determined that this use is not inconsistent with the classification.

NFS motorized trail 17E51, within the Caples Creek W&SR corridor, has the potential to affect habitat capability for trout and could affect the natural reproduction of trout, thereby adversely affecting the fisheries resource, which is one of the Outstandingly Remarkable Values for this stream (for further information, see the Terrestrial and Aquatic Wildlife section of Chapter 3). The seasonal closure included in this alternative will provide a level of protection for the Outstandingly Remarkable Value by prohibiting vehicle use of this trail when the soils are wet and the trail tread is susceptible to rutting and erosion. However, this trail is commonly closed by snow at that time of year, and so is often not accessible.

There are no adverse effects anticipated to the Outstandingly Remarkable Values for the remaining W&SR reaches (listed in Table 3-P.1) in this alternative.

Modified B

Indicator Measure 1: Under this alternative, the effects are the same as those described in Alternative C for the Caples Creek W&SR, and the Wild River segment of the recommended Rubicon W&SR.

Indicator Measure 2: Within the Scenic segment of the Rubicon River, 10.1 miles of NFS motorized trails would be open for motorcycle use only, between Ellicott's bridge and Hell Hole Reservoir. This Alternative does not include allowing motorcycle use on the South Fork trail. An additional 0.2 miles of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River near Ellicott's Bridge would be open for street-legal wheeled motor vehicle use only (see Table 3-P.2).

Indicator Measure 3: Under this alternative, the effects are the same as those described in Alternative B for the river segments found eligible for Recreation designation.

Indicator Measure 4: Under this alternative, the effects are generally the same as those described in Alternative B except for within the Caples Creek W&SR corridor, where none of the trails are open for public wheeled motor vehicle use. Not allowing this use on the trails will provide a marginally higher level of protection of the Wild River segment.

Alternative C

Indicator Measure 1: Under this alternative, public wheeled motor vehicle use would not be allowed on any of the trails within the eligible Wild segment of Caples Creek. This will provide a higher level of protection of the Wild River segment and will be consistent with Forest Service direction for management of eligible Wild River segments prior to completion of a suitability study. However, this will limit access to this eligible W&SR segment to non-motorized means and will restrict those that use motorcycles from accessing this river segment.

Public wheeled motor vehicle use would not be allowed on the portion of NFS ML-2 road 14N25G within the Wild segment of the Rubicon River in this alternative. Access to the river would be by non-motorized means only and would require traversing approximately 1.5 miles of very steep terrain.

Indicator Measure 2: Public wheeled motor vehicle use would not be allowed on any of the trails within the Scenic segment of the Rubicon River, between Ellicott's bridge and Hell Hole Reservoir. Two-tenths mile of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River near Ellicott's Bridge would be open for street-legal wheeled motor vehicle use only to access a dispersed camping area (see Table 3-P.2). Managing this corridor primarily for non-motorized uses will also meet the desired ROS (Recreation Opportunity Spectrum) Class for a Scenic River corridor (Management Practice 3, Management Area 2). Under this alternative, access to this eligible W&SR segment to non-motorized means only will restrict those that use motorcycles from accessing this river segment.

Indicator Measure 3: The effects to those river and stream segments eligible for Recreation classification would be similar to those described in Alternative B.

Indicator Measure 4: The limited mileage of designated motor vehicle routes would provide a high level of protection of the Outstandingly Remarkable Values for which the Rubicon Scenic River segment is recognized (its fisheries resource, including the good coldwater trout population and designation as a California Wild trout Stream (USDA FS. 1989, Appendix E, and the NRI)).

There are no adverse effects anticipated to the Outstandingly Remarkable Values for the remaining stream segments eligible for Wild or Scenic classification listed in Table 3-P.1 for this alternative.

Alternative D

Indicator Measures 1-3: Under this alternative, the effects are the same as those described in Alternative C for the Caples Creek W&SR, the Wild River segment of the recommended Rubicon W&SR, and the river segments found eligible for Recreation designation.

Within the northern portion of the Scenic segment of the Rubicon River, between Ellicott's bridge and Hell Hole Reservoir, 5.6 miles of motorized trails would be open for motorcycle use only, including NFS motorized trails 14E04 and 14E11, and the northern portion of 14E09. An additional 0.2 miles of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River near Ellicott's Bridge would be open for street-legal wheeled motor vehicle use, providing access to dispersed camping (see Table 3-P.2).

Indicator Measure 4: The presence of the motorized trails and their associated OHV use was recognized in the 1991 Forest Service appeal decision relating to the classification of this river segment, and as such, the agency has determined that this use is not inconsistent with the classification.

There are no adverse effects anticipated to the Outstandingly Remarkable Values for these stream segments for this alternative (see also the Terrestrial and Aquatic Wildlife section of Chapter 3).

Alternative E

Indicator Measure 1-3: Under this alternative, the effects are the same as those described in Alternative C for the Caples Creek W&SR, the Wild River segment of the recommended Rubicon W&SR, and the river segments found eligible for Recreation designation.

8.8 miles of NFS motorized trails would be open for motorcycle use only within the Scenic segment of the Rubicon River, between Ellicott's bridge and Hell Hole Reservoir, including the Hunter Trail (14E09) and the Hales Crossing Trail (14E04) to its intersection with the Hunter Trail. An additional 0.2 miles of an unauthorized route within the southern portion of the Scenic segment of the Rubicon River near Ellicott's Bridge would be open for street-legal wheeled motor vehicle use only to access dispersed camping (see Table 3-P.2).

Indicator Measure 4: As described above, the Outstandingly Remarkable Values for which the Rubicon Scenic River segment is recognized is its fisheries resource, including the good coldwater trout population and designation as a California Wild trout Stream (USDA FS. 1989,

Appendix E, and the NRI). The presence of the motorized trails and their associated OHV use was recognized in the 1991 Forest Service appeal decision relating to the classification of this river segment, and as such, the agency has determined that this use is not inconsistent with the classification.

There are no adverse effects anticipated to the outstandingly remarkable values for these stream segments for this alternative (see also the Terrestrial and Aquatic Wildlife section of Chapter 3).

Cumulative Effects for All Alternatives

Geographic Scale

The geographic scope of the cumulative effects analysis was limited primarily to the Wild and Scenic River corridors.

Analysis

The cumulative effects analysis for Wild and Scenic Rivers considers impacts of the Alternatives when combined with the following past, present, and foreseeable future actions and events: vegetation management and fuels reduction projects, and associated road construction (see Appendix E). These activities are the most likely to have an effect on the characteristics of the river segments that make them eligible for their respective classification.

As described in the Terrestrial and Aquatic Wildlife section of this Chapter, timber harvest and fuels reduction projects have been subject to the Standards and Guidelines set forth in the Sierra Nevada Forest Plan Amendment (USDA FS 2004c). As such, the environmental analysis of these projects includes a Riparian Conservation Objective (RCO) analysis. These RCO analyses assess aquatic conditions and include measures to minimize disturbance to Riparian Conservation Areas. Therefore, it is assumed that timber sales and fuels projects developed since 2004 have minimized adverse affects to aquatic resources, which are a key part of Wild and Scenic River characteristics. The environmental analysis of these vegetation management and fuels reduction projects also address effects to the other resources that comprise the Outstandingly Remarkable Values. The cumulative effects from implementation of the travel management project along with these other timber sales and fuels reduction projects is therefore considered to be minimal.

Q. Wilderness

Affected Environment

The ENF contains portions of two Congressionally designated wilderness areas (Desolation Wilderness and Mokelumne Wilderness), and an area recommended for wilderness designation in the ENF LRMP (the recommended Caples Creek Wilderness Area). See Map 7 for the locations. These areas are to be managed so as to preserve their natural conditions, with the imprint of man substantially unnoticeable, and with outstanding opportunities for solitude or a primitive and unconfined type of recreation. The congressionally designated wilderness areas are closed by regulation to all motorized equipment and mechanical transport, including motor vehicles (36 CFR 261.18). Forest Service Manual (FSM) 1923.03 provides the following policy direction for management of recommended wilderness areas:

> Any inventoried roadless area recommended for wilderness or designated wilderness study is not available for any use or activity that may reduce the wilderness potential of an area. Activities currently permitted may continue, pending designation, if the activities do not compromise wilderness values of the area.

FSM 2320.3(5) recognizes that wilderness does not exist in a vacuum and provides the direction that activities on both sides of wilderness boundaries should be considered during planning. At the same time, Forest Service direction is not to maintain buffer strips of undeveloped wildland adjacent to wilderness areas to provide an informal extension of wilderness, nor to maintain internal buffer zones that degrade wilderness values. As class I airsheds Desolation and Mokelumne Wildernesses must be managed to protect visibility. See the Air Quality section earlier in Chapter 3 for more information on this subject.

Desolation Wilderness: Desolation Wilderness became part of the National Wilderness Preservation System by Act of October 10, 1969, with a total of 63,475 acres. Of this total, 42,194 acres lie within the ENF. Proximity to large metropolitan centers and easy access result in Desolation being one of the more heavily used wilderness areas in the NFS. In November 1998, the Forest Plan was amended to incorporate Desolation Wilderness Management Guidelines. These guidelines included the continuation (with certain modifications) of a quota system for overnight use that has been in place since 1978. There is also a requirement for day-use wilderness permits, although there is no quota on these permits. Annual use of the ENF portion of Desolation Wilderness is estimated at about 7,500 overnight visitors and nearly 20,000 day use visitors. There are a number of roads and motorized trails outside of the wilderness on the ENF that provide access to the wilderness, such as the Wrights Lake road (11N26), the popular Barrett Lake 4WD Trail (11N26F) and Rubicon 4WD Trail (County road). The following table lists these trailheads and whether the access is by surfaced or native surface road.

Table 3-Q.1: Trailheads accessing Desolation Wilderness

Trailhead Name	Parking Spaces	Road/Trail Number	Road Surface
Loon Lake	40 spaces	13N17	Paved
Van Vleck	30 spaces (est.)	13N22	Paved
Wrights Lake Rockbound Twin Lakes Meadow Overflow	47 spaces 37 spaces 75 spaces	12N24A 12N23 11N26	Paved Paved Paved
Lyons	23 spaces	11N26	Paved
Pyramid Creek	47 spaces	Highway 50	Paved
Ralston	10+ spaces	11N11	Dirt
Buck Island	undefined	County Road (Rubicon 4WD Trail)	4WD only
Richardson Lake	undefined	14N39	4WD
Echo Lake	104 spaces	11N06	Paved
Barrett Lake	undefined	11N26F	4WD only

Mokelumne Wilderness: The Mokelumne Wilderness includes a total of 104,461 acres, 59,865 acres of which are in the ENF. Upon enactment of the Wilderness Act in 1964, the area became wilderness. The California Wilderness Act of 1984 added approximately 55,000 acres to the Mokelumne. Visitation to much of the Mokelumne Wilderness is generally light because of its ruggedness and remoteness. In contrast, the portion of the wilderness in the vicinity of Carson Pass and Highway 88 is very heavily used. The ENF LRMP was amended to incorporate the Mokelumne Wilderness Management Guidelines in March 2000. Annual use of the ENF portion of the Mokelumne Wilderness is estimated at about 2,000 overnight visitors and 25,000 day use visitors. Highway 88, which is suitable for passenger vehicles, serves as the primary access for visitors to Mokelumne Wilderness trailheads. From Highway 88, there are several other roads providing wilderness access, some of which are suitable for passenger vehicles (such as the road to Salt Springs Reservoir [8N50] and Blue Lakes road [County Road]) and some which are rough 4WD routes (including the Mud Lake road [9N04]), Forestdale Divide road [County road], Indian Valley road [19E04], and roads from Bear River Reservoir). The Squaw Ridge road [9N82] is adjacent to the wilderness boundary and the Clover Valley/Deer Valley road [9N83] splits the wilderness and is not a part of the wilderness. There are 52 miles of trails outside of the wilderness on the ENF that provide access to the wilderness. Several of these access trails are used by motorized vehicles, such as the Horse Canyon motorcycle trail. Some incursions into the wilderness by motor vehicles have occurred in the past based on observations by Wilderness Rangers, particularly near the summit of Forestdale Divide road (County Road ALP-5), from the Indian Valley road (19E04), and less frequently by ATVs off of the Squaw Ridge road (9N82) in the vicinity of the Beebe Lake trail, Munson Meadow trail, near Pardoe Lake, and north of the intersection of the Horse Canyon trail. In 2004, barriers were placed to restrict motor vehicles from entering the wilderness. These barriers have been effective in stopping 4WD vehicles; however, motorcycles and ATVs continue to go around the barriers. All of the trailheads providing access to the wilderness are accessed by motor vehicles. The following table lists the trailheads and whether the access is by surfaced or native surface road.

Table 3-Q.2: Trailheads Accessing Mokelumne Wilderness

Trailhead Name	Parking Spaces	Road/Trail Number	Road Surface
Salt Springs Reservoir	undefined	8N50	Paved
Tanglefoot	undefined	8N14E	Dirt
Munson Meadow	undefined	9N82	Dirt
Beebe Lake	undefined	9N82	Dirt
Horse Canyon	undefined	Highway 88	Paved
Caples Lake Dam	25 spaces	Highway 88	Paved
Woods Lake	23 spaces	County Road (ALP-122)	Paved
Carson Pass	53 spaces	Highway 88	Paved
Forestdale Divide	undefined	County Road (ALP-5)	Dirt
Evergreen	undefined	County Road (ALP-5)	Paved
Grouse Lake		County Road (ALP-5)	Paved
Indian Valley	undefined	19E04	Dirt

Caples Creek Recommended Wilderness: 17,340 acres within the Caples Creek planning area were set aside for further study in the 1984 California Wilderness Act. 13,694 acres of this area were recommended for wilderness designation in the ENF LRMP. In the 1989 Record of Decision for the ENF LRMP, there is the following statement: “Some 2-wheel drive trails within the area recommended for wilderness will be eliminated during Plan implementation if the area is designated (USDA FS. 1989, page 11).”

These trails include 17E51, 17E20, and 17E71, for a total of 8.4 miles of motorcycle trails. There is an additional 2.8 miles of unauthorized routes within the area that have had some level of motorized use in the past. NFS trail 17E52 is not a motorized trail; however, it has had motorized use, creating a loop by connecting to unauthorized route NST1752-A. NFS trail 17E63 has also had motorized use in the past, connecting 17E20 to road 09N20 and to unauthorized route

NST1763-A. There have been instances of motorcycle travel off of the existing trails, particularly within some of the flats and meadows at Jake Schneider meadow and along 17E71 south of Caples Creek. There are three roads or portions of roads within the recommended wilderness area; approximately 0.1 miles of 11N40B, approximately 0.8 miles of 10N16A, and approximately 0.4 miles of 10N30. Segments of NFS trails 17E20 and 17E71 have widened and eroded due to motorized use, which is affecting the wilderness character. Sections of these trails have been maintained for motorized use in the past; however, these trails have not been redesigned or reconstructed for motorcycle use. The primary trailheads or access points to Caples Creek Recommended Wilderness are shown in the following table.

Table 3-Q.3: Trailheads Accessing the Recommended Caples Creek Wilderness

Trailhead Name	Parking Spaces	Road/Trail Number	Road Surface
Fitch Rantz	undefined	11N40B	Dirt
Martin Meadow	undefined	10N16B	Dirt
Shealor Lake	21	Highway 88	Paved
Lake Margaret	15	Highway 88	Paved
Forgotten Flat	undefined	9N10	Dirt

Public use within the area is generally for overnight camping and day-use by hikers, equestrians, mountain bicycles, and motorcycle riders. Current use estimates are not available.

There have been various proposals for new wilderness areas or additions to existing wilderness areas, such as the California Wild .Heritage Act submitted in the Senate in 2007. In particular, there have recently been proposals to designate the Caples Creek area along with areas to the north and east as wilderness. However, these proposals have not been acted on by Congress, and so these proposals will not be analyzed further.

Analysis Framework

Data & Assumptions

For a discussion of data and assumptions used in this analysis see the beginning of Chapter 3.

Indicator Measures

To display the differences between the Alternatives, in regards to the direct and indirect effects to Wilderness Areas and Recommended Wilderness Areas on the ENF, the following indicator measures were used:

Indicator Measure 1: Miles of motorized trails open to public wheeled motor vehicle use within the Caples Creek Recommended Wilderness Area;

Indicator Measure 2: Miles of native surface motorized routes open to public wheeled motor vehicle use within one mile of a Wilderness boundary;

Indicator Measure 3: Public wheeled motor vehicle access to existing wilderness trailheads; and

Indicator Measure 4: Individual routes that have been the source of wilderness incursions in the past open for public wheeled motor vehicle use.

These measures were selected to display the impacts to the wilderness resources, including direct impacts from trail widening within the wilderness; loss of vegetation and wildlife habitat and subsequent erosion within wilderness areas; reduction of opportunities for solitude; and impacts to air quality.

Environmental Consequences

Direct and Indirect Effects for All Alternatives

Indicator Measure 1: Motorcycle use on trails within the Caples Creek Recommended Wilderness will continue to degrade some of the trails within this area unless they are redesigned and reconstructed to accommodate this use, and will continue to degrade the wilderness character to a limited degree. The impacts to these trails, and adjacent resource damage, include riparian sedimentation, stream bank damage at trail crossings, localized damage to meadow habitat, and vegetation loss due to trail widening. Use of these trials by equestrians and hikers also contributes to the resource damage and will limit the benefits from restricting motorcycle use on these trails. Table 3-Q.4, below, displays the number of miles of trails that would be open for public wheeled motor vehicle use within the Caples Creek Recommended Wilderness for each Alternative. Alternatives Modified B through E will provide the highest level of protection of the wilderness resource, relative to Alternatives A and B. Continued cross-country travel within Alternative A will further impact the wilderness character adjacent to the motorized trails.

Table 3-Q.4: Miles of trails upon which motorcycle use will be allowed within Caples Creek Recommended Wilderness for each alternative

	A	B	Modified B	C	D	E
Miles of Trails open for Motorcycle Use	12.0	7.3	0	0	0	0

Indicator Measure 2: Noise from motor vehicles operating outside of the wilderness affects solitude opportunities within wilderness areas. Studies conducted to evaluate the detectable distance of OHVs in forest conditions found that less than five percent of OHVs were detectable at a distance of one mile (Harrison 1975, Harrison and others 1993; see additional discussion on Noise in the Recreation section of this Chapter). Motor vehicles operating on gravel and native surfaced roads also have the potential to create fugitive dust and negatively affect air quality within wilderness areas (Tonnessen 2000, Padgett et al. 2007, Gillies et al. 2005).

Table 3-Q.5 displays the total number of miles of native surface roads and trails open for public wheeled motor vehicle use in each alternative within one mile of the wilderness boundary. This use would create noise and reduce opportunities for solitude, and contribute negatively to air quality due to dust. This table also displays the breakdown for each of the Wilderness areas by alternative. Alternative A has the greatest number of miles of native surface roads and trails within one mile of the wilderness boundary, with an associated higher potential for reduced opportunities for solitude and reduced air quality locally. Alternative E has the least number of miles of native surface roads and trails, with an associated lesser potential for reduced opportunities for solitude and reduced air quality locally. Alternatives B, Modified B, C, and D, respectively, have fewer miles than Alternative A.

Table 3-Q.5: Miles of native surface roads and trails open for public wheeled motor vehicle use within one mile of wilderness boundary

Alternative	Road and Trails (miles)			
	Desolation Wilderness	Mokelumne Wilderness	Caples Creek Recommended Wilderness	Total
A	15.1	66.8	74.4	156.3
B	12.0	48.5	49.1	109.6
Modified B	10.5	52.3	40.8	103.6
C	10.2	44.1	32.6	86.9
D	10.2	44.6	29.2	84.0
E	7.5	19.0	15.8	42.3

Indicator Measure 3: Use of a wheeled motor vehicle is the primary means of accessing trailheads for nearly all wilderness visitors on the ENF. Eliminating public wheeled motor vehicle use of roads accessing trailheads into wilderness areas will increase the hiking distance to the wilderness area from where people park their motor vehicles. This increased hiking distance may reduce public use of these trailheads and the portion of wilderness accessed from that trailhead. Alternately, some wilderness visitors may prefer the non-motorized access to the wilderness. Table 3-Q.6 identifies the type of public wheeled motor vehicles by alternative that will be allowed to use the roads accessing trailheads for Desolation Wilderness. Table 3-Q.7 shows this same information for Mokelumne Wilderness, and Table 3-Q.8 shows this information for Caples Creek Recommended Wilderness.

The seasonal closures proposed under each of the action alternatives will limit motor vehicle access to some trailheads or wilderness access points during the closure period. Only a small number of the trailheads are accessed by native surface roads (as shown in tables in the Affected Environment section, above), which are the only routes to which the seasonal closure applies. These roads are commonly impassable to passenger cars due to snow at these higher elevations during much of the seasonal closure period. Therefore the seasonal closure will have only a limited effect on access to the trailheads by wilderness visitors.

Table 3-Q.6: Comparison between Alternatives of motorized access to Desolation Wilderness trailheads

Trailhead Name	Alternative A	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
Loon Lake	Street legal only	NC	NC	NC	NC	NC
Van Vleck	All vehicles	Street legal only	Street legal only	Street legal only	Street legal only	Street legal only
Wrights Lake, Rockbound, Twin Lakes, Meadow overflow	Street legal only	NC	NC	NC	NC	NC
Lyons	Street legal only	NC	NC	NC	NC	NC
Pyramid Creek	Street legal only	NC	NC	NC	NC	NC
Ralston	Street legal only	NC	NC	NC	NC	NC
Buck Island	4WD	NC	NC	NC	NC	NC
Richardson Lake	All vehicles	NC	NC	NC	NC	NC
Echo Lake	Street legal only	NC	NC	NC	NC	NC
Barrett Lake	4WD	NC	NC	NC	NC	Not accessible by motor vehicle

NC = no change from Alternative A

Table 3-Q.7: Comparison between Alternatives of motorized access to Mokelumne Wilderness trailheads

Trailhead Name	Alternative A	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
Salt Springs Reservoir.	Street legal only	NC	NC	NC	NC	NC
Tanglefoot	All vehicles	Street legal only	Street legal only	Street legal only	Street legal only	Street legal only
Munson Meadows	4WD	NC	NC	NC	NC	Not accessible by motor vehicle
Beebe Lake	4WD	NC	NC	NC	NC	Not accessible by motor vehicle
Horse Canyon (non-wilderness portion)	Street legal only. Trail open to motor-cycles	NC	NC	Street legal only. Trail		

Table 3-Q.8: Comparison between Alternatives of motorized access to Caples Creek Recommended Wilderness trailheads

Trailhead Name	Alternative A	Alternative B	Modified B	Alternative C	Alternative D	Alternative E
Fitch Rantz	All vehicles	NC	NC	Street legal only	Street legal only	Street legal only
Martin Meadow	All vehicles	Street legal only	NC	Street legal only	Street legal only	Street legal only
Shealor Lake	Street legal only	NC	NC	NC	NC	NC
Lake Margaret	Street legal only	NC	NC	NC	NC	NC
Forgotten Flat	All vehicles	NC	NC	Street legal only	Street legal only	Street legal only

NC = no change from Alternative A

As can be seen from the tables above, Alternative A provides the greatest level of motorized access to the wilderness trailheads, whereas Alternatives B, Modified B, C, and D provide motorized access to most of the trailheads. Although, that access is in many cases limited to street-legal vehicles only, this restriction will have only a limited effect to wilderness visitors, since they primarily use passenger vehicles for access to these trailheads. Alternative E provides a reduced level of access, with wheeled motor vehicle access prohibited to some of the trailheads, particularly those serving the Mokelumne Wilderness.

Indicator Measure 4: Incursions into wilderness areas have been from various routes open to wheeled motor vehicles that are near or adjacent to the wilderness boundaries, as described in the Affected Environment section above. The following narrative describes whether those individual routes which have been the source of wilderness incursions in the past will be open for public wheeled motor vehicle use under each of the Alternatives.

Alternative A

Desolation Wilderness: No existing routes adjacent to Desolation Wilderness have been identified with motorized incursions into the wilderness. Therefore, the likelihood of future motor vehicle incursions into Desolation is neither increased nor decreased in this alternative.

Mokelumne Wilderness: The Forestdale Divide Road is a county road, and so uses do not vary across any of the alternatives. Under this alternative, public motor vehicles use of the Indian Valley trail would not be prohibited, with an associated potential for future motorized incursions into the eastern portion of the wilderness. Public motor vehicle use of Squaw Ridge Road would not be prohibited, and so there may continue to be incursions into the wilderness in those areas where incursions have occurred in the past.

Caples Creek Recommended Wilderness: Under this alternative, motorcycle use of trails 17E51, 17E20, and 17E71, and unauthorized routes NST1763-A, NST1752-A, and NSR1016A-A, would not be prohibited. There would also continue to be the potential for short excursions off of these motorized trails, similar to what has occurred in the past.

Alternative B

Desolation Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A.

Mokelumne Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A, except that the Indian Valley trail would not be designated for public wheeled motor vehicle use. Thus, the likelihood of wilderness incursions would be reduced in that area.

Caples Creek Recommended Wilderness: Under this Alternative, trail 17E51 would be designated open to motorcycles all the way from Fitch-Rantz to Road 10N14, allowing for through travel. However, the northern segment of Trail 17E51 has not been managed for motorized use in the past. This designation would be inconsistent with the direction for management of areas recommended for wilderness stated in FSM 1923.03 (see affected environment section).

Trails 17E20 and 17E71 would not be designated for public wheeled motor vehicle use, eliminating the motorcycle use within that portion of Jake Schneider Meadow and other areas within the Caples Creek valley. Unauthorized routes NST1752-A and NSR1016A-A would not be designated for public wheeled motor vehicle use. This would also reduce the use of 17E52 through Government Meadow, as there will no longer be a loop available. Unauthorized route NST1763A would be designated for motorcycle use only within the recommended wilderness, along with a 0.6 mile segment of 17E63. This would create a throughway from Silver Lake (near Kays Resort) westward to NFS road 09N20 and beyond. This designation would not be consistent with direction in FSM 1923.03 and may, to a limited extent, reduce the wilderness character by erosion, degradation and possible widening of unauthorized route NST-1763A.

Modified B

Desolation Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A.

Mokelumne Wilderness: The effects are the same as Alternative B.

Caples Creek Recommended Wilderness: The effects are the same as Alternative C.

Alternative C

Desolation Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A.

Mokelumne Wilderness: The effects are the same as for Alternative B, except that the Horse Canyon Trail (17E21) would not be designated for public wheeled motor vehicle use, reducing (but not eliminating) the motorized use of Squaw Ridge and the potential for motorized incursions into the wilderness.

Caples Creek Recommended Wilderness: Under this alternative, none of the trails within the Caples Creek Recommended Wilderness would be designated for public wheeled motor vehicle use. This would eliminate the impacts from motor vehicle traffic and the potential for excursions off of the trails within the area.

Alternative D

Desolation Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A.

Mokelumne Wilderness: The effects are the same as for Alternative B, except that the trail into Indian Valley would be designated for street-legal and OHV use. This designation has the potential for future motorized incursions into the eastern portion of the wilderness, similar to what has occurred in the past.

Caples Creek Recommended Wilderness: The effects are the same as Alternative C.

Alternative E

Desolation Wilderness: The potential for public wheeled motor vehicle incursions is the same as Alternative A.

Mokelumne Wilderness: The effects are the same as Alternative C.

Caples Creek Recommended Wilderness: The effects are the same as Alternative C.

Cumulative Effects for All Alternatives

Geographic Scope

The geographic scope of the cumulative effects analysis for this section was limited primarily to Wilderness areas and areas within one mile of the wilderness boundary because the effects from noise, dust, and motorized incursions are the primary impact sources.

Analysis

The cumulative effects analysis for wilderness areas considers impacts of the Alternatives when combined with the following past, present, and foreseeable future actions and events: noise from motor vehicles operating outside of a wilderness area, combined with the sounds of hikers, campers, other wilderness visitors, aircraft overflights, and occasionally distant motorized equipment; smoke from wildfires and prescribed burns; dust from motor vehicles operating on native surface roads outside of the wilderness; and other soil disturbing activities such as road and trail construction, or land disturbing activities within the Central Valley.

The noise from motor vehicles operating outside of a wilderness area, combined with the sounds of hikers, campers, other wilderness visitors, aircraft overflights, and occasionally distant motorized equipment, cumulatively impacts the opportunities for solitude. The noise from the operation of motorized equipment associated with various management activities will further reduce the opportunities for solitude. The difference in cumulative impacts between alternatives cannot be quantified, but does not appear to be significantly different, based on a review of other foreseeable projects in the vicinity of Desolation Wilderness, Mokelumne Wilderness, or the Recommended Caples Creek Wilderness (past and foreseeable future projects are listed in Appendix E).

Smoke from wildfires and prescribed burns results in reduced visibility and may pose the most significant threat to wilderness air quality (USDA FS. 1998, pg-3-8). Vehicles operating on native surface roads, however, also have the potential to affect visibility within wilderness areas (see the Air Quality section in this Chapter for further discussion). This source, combined with other soil disturbing activities such as trail construction and land disturbance activities in the Central Valley, have the potential to cumulatively impact wilderness air quality. The travel management project is not likely to alter the cumulative air quality effects from this and other current and foreseeable activities.

R. Socio-economic Environment & Environmental Justice_

Affected Environment

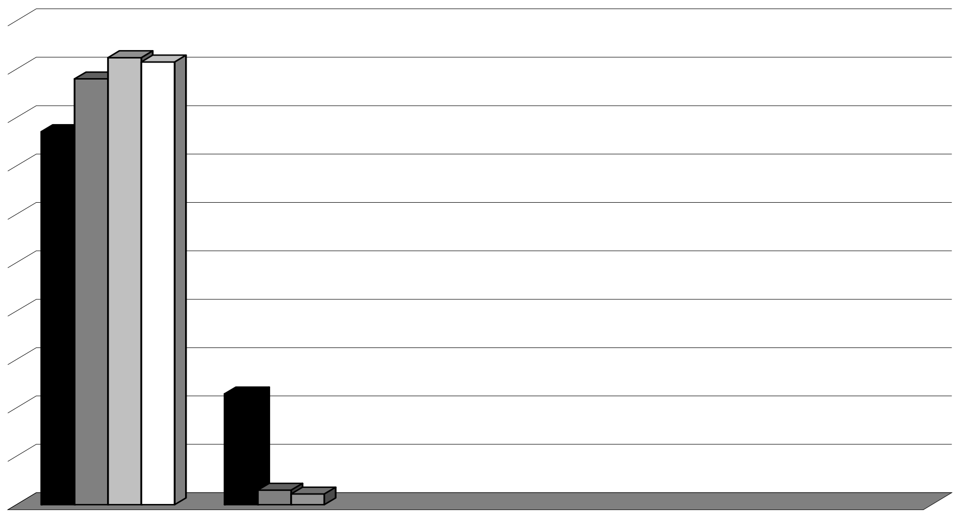
The ENF is located within four counties – Alpine, Amador, El Dorado, and Placer – and is surrounded by several rural communities: Georgetown to the northwest, Placerville to the west, and Markleeville to the southwest. Associated with many of these rural communities is a large component of the wildland-urban interface (WUI) with private residences along the western border of the Forest and along the two major highways bisecting the Forest. Private land within the boundaries of the Forest is primarily owned by a few private timber corporations, combined with some private residences and resorts. Development within the Forest boundary is minimal, while development adjacent to the Forest boundary continues to grow at a consistent pace.

The ENF is also within a reasonable drive from several metropolitan areas, including an hour from Sacramento, CA, two and a half hours from San Francisco, CA, and an hour from Reno, NV. The eastern border of the Forest is within 25 miles of the vacation resort town of South Lake Tahoe, which attracts visitors from around the world. As well as being a vacation Forest to a few million visitors every year, it is a backyard forest to the myriad of subdivisions located within and adjacent to its borders.

Population, Race, and Gender

The population estimates for 2005 were 1,159 for Alpine County, 38,471 for Amador County, 176,841 for El Dorado County, and 317,028 for Placer County (U.S. Census Bureau 2005 Population Estimates). The annual percent growth from the 1990 U.S. Census is 1.0 percent for Alpine County, 1.3 percent for Amador County, 1.4 percent for El Dorado County, and 1.8 percent for Placer County. The following graph illustrates the racial distribution for the four counties within the study area.

Figure 3-R.16

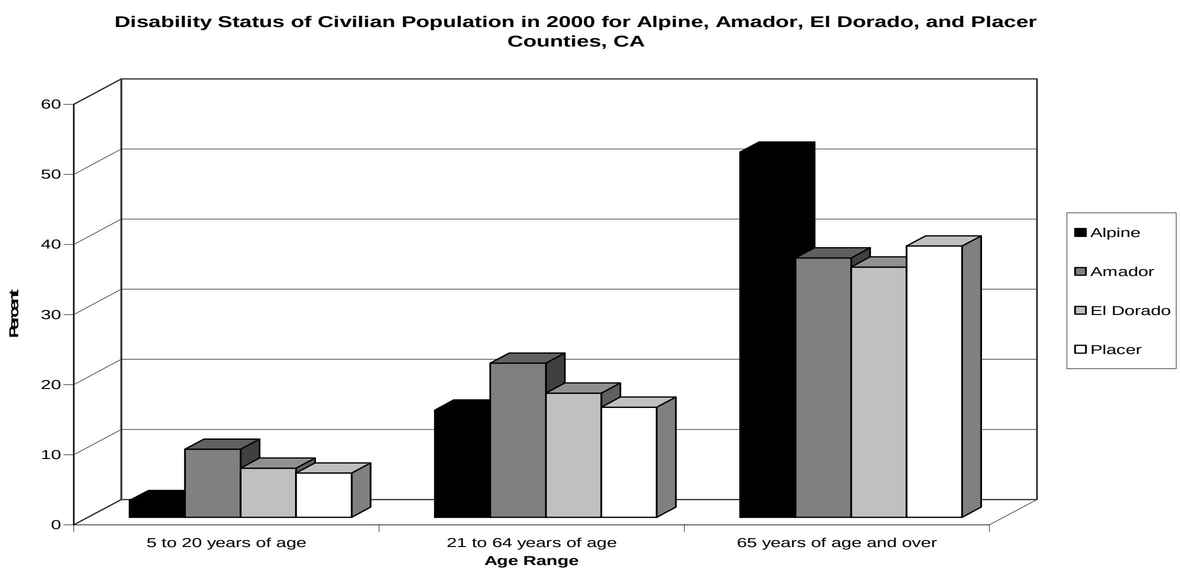


vehicle, are also important recreation activities on the ENF and provide revenue to local economies.

Visitors with Disabilities

The following graph illustrates the disability status of the civilian population in 2000 for Alpine, Amador, El Dorado, and Placer Counties. This figure shows that a greater percentage of the total population within the age group of 65 years and over have a disability compared with the other two age groups.

Figure 3-R.17



Tribes

Important considerations in the fulfillment of the Forest Service mission is the trust relationship the Forest Service has with American Indians and Alaska Natives (Tribes) and the potential impact Forest Service policy, program, and project decisions may have on Tribes. The Forest often serves as a source of traditional medicines, food, firewood, and basket making materials. Within the administrative boundaries of the ENF are important historical and spiritual areas that have cultural significance for Tribes. Certain areas may also be particularly sacred and valued for their importance in sustaining cultural traditions and beliefs. Native people utilize motorized roads and trails to access these areas.

Analysis Framework

Data and Assumptions

For a discussion of the data and assumptions used for this analysis refer to the beginning of Chapter 3.

Indicator Measures

Indicator Measure 1: Effects to local economies.

Indicator Measure 2: Effects to minority or low-income populations or communities.

Indicator Measure 3: Effects to visitors with disabilities.

Indicator Measure 4: Effects to Tribes.

Environmental Consequences

Direct, Indirect, and Cumulative Effects for All Alternatives

Indicator Measure 1: A review of potential economic impacts was conducted to determine if the action alternatives B-E, including Modified B, would result in impacts to the area's economy relative to Alternative A. It is assumed that primary changes would be to motorized and non-motorized recreational users on the Forest.

The National Visitor Use Monitoring (NVUM) study results from 2003 were used to identify the percentages of motorized and non-motorized users on the Forest. This study estimated that approximately 3.3 percent of the visitors on the Forest identified OHV travel as their primary recreational activity. This equates to 70,690 visits of the 2.12 million visits to the Forest. Approximately 7.4 percent of forest visitors identified OHV travel as a primary or secondary recreational activity, which equates to 155,985 of the forest visits. The top five main activities for forest visitors included downhill skiing, hiking, fishing, relaxation, and developed camping (USDA FS. 2004). These five activities accounted for 72.5 percent of the main activities for forest visitors in 2003. In addition to these five activities, primitive camping, hunting, horseback riding, bicycling, and wildlife viewing are also prevalent non-motorized activities on the Forest. Although these non-motorized recreational activities have a higher demand on the Forest, it must be noted that motor vehicles, as well as roads and trails, are used to access these opportunities.

The NVUM surveys included questions about where Forest visitors came from and how much visitors spent within fifty miles of the Forest during their recreation visit. Results from this monitoring show that approximately 50% of the Forest visitors came from the counties surrounding or very near the Forest, including Alpine, Amador, Calaveras, Carson City (NV), Douglas (NV), El Dorado, Lyon (NV), Placer, Sacramento, and Yuba counties. This monitoring also shows that overnight recreation visitors spent on average $125 per party per trip and day-visitors spent an average of $30 per party per trip (Stynes and White 2005). The average spending of visitors to the ENF was found to be below the national average, and is below the average spending of recreation visitors to the adjacent National Forests. Purchases of fuel and groceries make up over 50% of the total spent. Other market surveys of outdoor recreation visitation found comparable spending patterns. A market survey of central and northern California outdoor recreation visitors found the average spending per party was $503 per trip (Tierney, Rosegard, and Absher, 2002). This spending average does not distinguish between those camping in public campgrounds, private campgrounds, or other lodging. Approximately 52% of the average expenditure was for food and fuel or transportation. Another study of spending by campers in California found the average expenditure per party per trip for those staying in FS or BLM campgrounds was $132 in 1999-2000 (Dean Runyon Assoc., 2000). Of this total, 65% was for fuel and groceries. Average expenditures for those staying in private and commercial campgrounds or National Park campgrounds were greater. The information available regarding per-trip expenditures indicates that revenue generated from recreation visits to the ENF may be significant for individual businesses, but is only a small percentage of the overall local economy.

Predictions about changes in recreational use that may occur on the Forest based upon which alternative is selected are difficult to make and would be highly speculative. The Forest Service believes that under all action alternatives, levels of use would be relatively static although the use patterns may change. The 2003 visitor use information described above and in the Recreation section of this Chapter shows that visitor use on the Forest is already distributed over a number of different recreation activities and that the Forest offers a variety of recreation opportunities. In addition, many Forest visitors are from the local area, and will continue to use the Forest under each of the action alternatives. For example, even though the overall number of available roads and trails is reduced in all of the action alternatives, the same level of use may continue but become more concentrated in areas that remain open to public wheeled motorized vehicle use. However, public wheeled motor vehicle use is already concentrated in many areas of the Forest at this time, especially during peak days and seasons, so this effect may not be realized during implementation. At some point, however, some users may no longer attain the experience they desire and would likely seek other areas off-forest, potentially impacting economies in the local area. The point at which this would occur is speculative.

A seasonal closure of at least three months on native surface ML-2 roads and system trails is likely to have some level of impact to the local economy. Yet, this effect, again, is nearly immeasurable in comparison to the overall local economy. The total change in use during this seasonal closure and the change in spending patterns is speculative, since surfaced roads will still be open to use, snow covers many routes making them impassable for much of the seasonal closure period, and the amount of use on native surface roads during this period is relatively small in relation to the total use on surfaced and native roads (based on a review of the 2003 NVUM data regarding winter activities visitors participate in). The seasonal closure would likely impact gas stations, convenience stores, and other retail stores in local communities outside of the Rock Creek area, which remains open for public wheeled motor vehicle use most times of the year. Georgetown and other local communities accessing the Rock Creek area may see an increase in their local economies if use becomes concentrated in Rock Creek during the months of the forest-wide seasonal closure, or these visitors may seek alternative places to go, or switch to a different activity. It is not assumed that the changes proposed to wheeled OST recreation in the action alternatives would have a significant impact or measurable change compared to Alternative A.

Other ongoing and foreseeable future activities (such as those listed in Appendix E) may provide economic benefits to local communities, such as the development of jobs and local tax revenue. The cumulative effect of implementation of any of the alternatives for this project, along with the potential socioeconomic effects of other past, present and foreseeable future actions is speculative, particularly since the effects of this project are not considered to vary considerably by alternative.

Indicator Measure 2: None of the alternatives show any identifiable effects or issues specific to any minority or low-income population or community. Based on Year 2000 U.S. Census Data, California consists of 43.2 percent minority and 14.2 percent low-income populations. The four counties within which the ENF is located all consist of 16.8 percent minority and 7.1 percent low-income populations. Changes in road and trail management would have the same effect on all groups of people including minorities and different cultures. No civil rights effects associated with age, race, creed, color, national origin, or gender have been identified.

Indicator Measure 3: Effects to visitors with disabilities are described in the Recreation section of Chapter 3. In general, those alternatives with fewer miles of roads and trails open for public wheeled motor vehicle use (see Table 2-10) will provide fewer opportunities for the general public, including visitors with disabilities access to areas within the National Forest. Alternatives A, B, Modified B, C, D, and E, respectively, provide fewer miles of open native surface routes. The effects to individuals with disabilities will depend in part on the activities those individuals participate in and their mode of transportation.

Indicator Measure 4: Several specific roads and trails have been identified as important for access and are proposed to be open for motor vehicle use in each alternative, if they are currently managed as open for that use. While each of the action alternatives provides increased protection of cultural resource sites important to Tribes in comparison to Alternative A, there is a concern that the action alternatives may limit access to cultural or spiritual sites by restricting use of roads and trails, the closure of certain unauthorized roads or trails, and seasonal restrictions on use of certain roads or trails during the wet weather periods. However, if through monitoring or from new information provided by Tribal members, specific roads and trails are identified in the future as needed for access to specific cultural or spiritual sites, the ENF may authorize that access through a special use permit, or may determine whether to allow public wheeled motor vehicle use on the route. The potential impacts to native American heritage sites or other natural resources are described in the Heritage, Wildlife, and other sections of this Chapter.

S. Heritage Resources

Affected Environment

Cultural resources, the remains of past human activity, provide a record of human activity within the ecosystem and a meaningful context for resource managers to assess the existing condition of a landscape.

The analysis area contains evidence of an extensive record of human activity, with the heaviest use occurring within the last 4,000 years. Materials discovered from the Forest indicate that people have been visiting the general vicinity for at least 7,000 years. Cultural resource sites in the analysis area are comprised of both historic and prehistoric properties that represent several thousand years of human occupation.

By 5,000 years ago, permanent villages were well established on the western Sierran slopes at elevations generally below 3,500 feet. Three Native American ethnographic groups (Northern Sierra Miwok, Nisenan, and Washo) were utilizing the resources within the ENF boundary by late prehistoric times. Archaeological evidence confirms rather widespread use and activities due to a wide array of site types; small prehistoric surface scatters of lithic tools and debitage; and relatively complex sites containing a range of resource classes such as bedrock mortars, groundstone, lithic scatters (flaked and ground stone), middens (culturally modified soil), rockshelters, petroglyphs, temporary and base camps; and possible year-round villages.

Prior to the opening of the Trans-Sierra roads by immigrant parties, native people utilized an extensive transportation system throughout the Sierra. Many of the trails used for seasonal travel by the Washo, Nisenan, and Miwok later became some of the major routes into California.

Historic activities, such as mining, logging, homesteading, recreation, and ranching, also left an imprint on the landscape within the project area. Linked to these activities, access to and through the region had a great impact on the development of California. Some of the most important historic transportation corridors, such as the Carson Emigrant Trail, Pony Express Trail, and Lincoln Highway, passed directly through what is now the Eldorado National Forest.

In the 1820s, explorers and trappers began traversing this area using previously established trails by native groups. During the winter of 1844, John Fremont, along with frontier scout Christopher "Kit" Carson, crossed the Sierra Nevada through the general vicinity of the Highway 88 corridor. The exploration was motivated by political ambition, military reconnaissance, and advancing the general knowledge of the west, in particular the Sierra Nevada mountains and California. Fremont followed a narrow ridgeline to the northwest, reaching the South Fork of the American River somewhere near present-day Strawberry Valley. Fremont's crossing has been discussed by many historians, yet his precise route over the Sierra has, as yet, not been verified by physical evidence or archaeological documentation (Supernowicz, n. d.).

It was not until the discovery of gold in Coloma in 1848 that the area was subject to a rapid and unprecedented population expansion. During this time, El Dorado County boasted one of the largest populations in the State. The effects of such a massive influx of people are visible throughout the ENF in the form of mining activities, wagon roads, abandoned homesteads, and blazed trees. In addition to the population increase, was the development of other industries such as agriculture, logging, grazing, and the improvement of dependable water. These industries were also responsible for additional road building and family settlements on the Forest.

As the momentum of people entering California increased, so did the efforts to discover the lowest, easiest, and most direct route to the gold fields and surrounding towns. A series of roads following approximately the alignment of today's U.S. 50, named Johnson's Cut-off, was picked as the favorable passage into the California gold fields (U.S. 50 went through Johnson's Pass until the present highway over Echo Summit, about a mile to the south was completed some time before 1950). The old road is still maintained for access to summer cabins and Echo Lake (Howard 1998). By the early 1860s various segments of road stretching from Placerville to the Carson Valley merged to create the Lake Tahoe Wagon Road. This toll road became one of the great thoroughfares of the West and California's first state highway. In 1913, the route was designated by the Lincoln Highway Association as the "Pioneer Branch" of the Highway (Supernowicz 1991), and in 1928, the route was officially designated U.S. Route 50.

After the decline in the mining, logging, and grazing industries, recreation increased greatly in importance (Beesley 1996). The Sierra Nevada provided many options for recreation and beautiful scenery. By the end of the 19th century, publications regarding tourism became a regular industry. From 1900-1940, the Sierra Nevada was subject to large changes due to the introduction of the automobile. With the introduction of the automobile there was increased access and a greater recreation demand. After 1900, tourist revenues created by automobile access grew in economic importance in areas where roads and natural beauties were located (Beesley 1996). The ENF, established in 1907 and ideally situated between Sacramento and Lake Tahoe, increased its availability of improved campgrounds and recreational activities. Some of the activities included, but were not limited to, skiing, car camping, snow shoeing, summer home construction, and hiking. Remnants of these past

- Designation of public wheeled motor vehicle use on a route currently not designated for wheeled motor vehicle use; and
- Designation of an unauthorized route as open for public wheeled motor vehicle use.

In addition, this project complies with the provisions set forth within the Programmatic Agreement among the USDA Forest Service, Pacific Southwest Region, USDA Forest Service, Intermountain Region's Humboldt-Toiyabe National Forest, California State Historic Preservation Officer, and Advisory Council on Historic Preservation Regarding the Process for Compliance with Section 106 of the National Historic Preservation Act for Designating Motor Vehicle Routes and Managing Motorized Recreation on the National Forests in California (USDA FS 2006a)(Motorized Recreation PA).

The procedures and stipulations within the Motorized Recreation PA include the identification and treatment of at-risk historic properties. An at-risk historic property is a property that has been identified as susceptible to being adversely affected as a result of activities associated with this project. A property is identified as "at-risk" based on that property's characteristics, proximity to designated OHV routes or specifically defined areas (e.g. trail corridor, trail head, vista point), and landscape features. Therefore, there may be a lower number of at-risk historic properties than the number of known cultural resource sites located within the project's area of potential effects (APE).

Data

Past archaeological support of Forest projects has resulted in a total of 263,204 acres surveyed for cultural resources on the ENF. For this project, all moderate and high-use unauthorized routes were surveyed (Walker 2006), in accordance with provisions of the Motorized Recreation PA. At present, a total of 2,122 cultural resource sites have been located within the ENF. This work, combined with past survey and existing site information, comprise the information used for this analysis.

Table 3-S.1: Recorded cultural resource sites within unauthorized routes APE by alternative

Total Recorded Sites	A	B	Mod B	C	D	E
2,122	228	18	9	10	17	5
Percent of Total	11%	<1%	<1%	<1%	<1%	<1%

Table 3-S.2: At-risk historic properties within unauthorized routes APE by alternative

Total Recorded Sites	A	B	Mod B	C	D	E
2,122	132	9	4	5	8	3

Identified at-risk historic properties for this project all share common characteristics. These sites are prehistoric archaeological sites that include buried deposits (e.g. lithic scatters and midden) and are bisected by, or immediately adjacent to, proposed unauthorized routes. Values associated with buried deposits can cause these sites to be susceptible to ground disturbance such as erosion, rutting, and down cutting of the soil on these routes. In addition, site boundaries of these sites are ill-defined as they have been based solely on surface observations. Sub-surface testing of these sites will only assure the true extent of these sites. Alternative A includes 132 sites with these features. The following table displays specific at-risk historic properties located in the action alternatives.

Table 3-S.3: Specific at-risk historic properties in the action alternatives

Site Number	B	Mod B	C	D	E
51-428	X			X	
51-511	X				
55-192	X	X		X	
55-280	X			X	X
56-27	X	X	X	X	
56-410	X	X	X	X	X
56-497	X		X	X	
56-54	X	X	X	X	X
56-794	X		X	X	

The Motorized Recreation PA outlines future work in support of the final decision that will include the development of a monitoring plan for at-risk historic sites in order to measure effects in areas with high concentrated use and with high site density or high value sites, such as the Meiss and Caples Creek areas located on the Placerville Ranger District. Treatment for identified at-risk historic properties in the future may include applying specialized resource protection methods such as fencing, barriers, and/or rocking during implementation of the designated route system, and may include site evaluation and data recovery if protection measures are ineffective.

Assumptions

For a general list of assumptions refer to the beginning pages of Chapter 3. The following list of assumptions is specific to heritage resources.

- Direct effects to at-risk historic properties are limited to the route corridor for all Action Alternatives. Direct effects include erosion, down cutting, and rutting within site boundaries.
- Indirect effects to at-risk properties include effects from activities associated with public wheeled motor vehicle use that may occur outside the route corridor such as staging areas, dispersed camping, increased access to at-risk sites, concentration of vehicles in areas, and the possibility of vehicles traveling off the route corridor due to a variety of factors such as trail condition and rider experience.
- Indirect effects include erosion, down cutting, rutting, and off-route tracks within site boundaries, as well as increased vandalism and looting. Dispersed camping, in particular, is of concern, as many existing dispersed camp sites are located within prehistoric sites due to common human camp site selection values, in particular the proximity to water features and gentle topography. Damage from dispersed camping has been well documented during past monitoring efforts, and conservation of cultural resource values continues to be a challenge.

Indicator Measures

Indicator Measure 1: Direct effects to at-risk historic properties.

Indicator Measure 2: Indirect effects to at-risk historic properties

Environmental Consequences

Direct and Indirect Effects

Alternative A

Indicator Measure 1: This alternative has the greatest potential to directly negatively affect at-risk historic properties due to the large number of at-risk historic properties located within route corridors, combined with no prohibitions on current existing routes for public wheeled motor vehicle use.

Indicator Measure 2: This alternative has the greatest potential to indirectly negatively affect at-risk historic properties due to the number and location of routes, combined with no prohibition on public wheeled motor vehicle cross-country travel. Due to the high mileage of unauthorized routes (with many being low-use), and the ability for wheeled motor vehicles to travel cross-country off of existing routes, there is greater potential for damage of those cultural resource sites not discovered due to such factors as dense vegetation and of those sites that are comprised of buried deposits (such as lithic scatters). While the Motorized Recreation PA contains direction for monitoring, deferred survey, specialized protection measures, and evaluation and mitigation measures, the amount of heritage work necessary to support this alternative would be difficult and cost-prohibitive.

All Action Alternatives

Indicator Measure 1: Alternatives B, Modified B, C, D, and E have low potential to directly negatively affect at-risk historic properties due to the small percentage of at-risk historic properties located within route corridors. These alternatives also have a moderate potential to indirectly negatively affect at-risk historic properties due to the number and location of routes and associated use areas. There is, however, a concern for cultural resource sites not discovered due to such factors as dense vegetation and those sites that are comprised of buried deposits (such as lithic scatters). The amount of heritage work, outlined in the Motorized Recreation PA, necessary to support these alternatives, would not be difficult or cost-prohibitive.

Indicator Measure 2: All action alternatives would reduce the current risk of impacts to cultural resources from existing public wheeled motor vehicle use and activities as the design of these alternatives does not include many unauthorized routes with the potential to adversely affect sites. In addition, the action alternatives prohibit public wheeled motor vehicle cross-country travel and have a wet weather seasonal closure, further reducing the potential for adverse effects to cultural resources. Thus, these alternatives should have an overall beneficial effect to cultural resources.

Cumulative Effects

Spatial Scale

The geographic scope of the cumulative effects analysis is the project boundary. It was selected because impacts to heritage resources accumulate at the specific location of the heritage resources, irrespective of actions in surrounding areas. Due to this fixed nature of cultural resource sites, the geographical scope is limited to the boundary of this project (ENF administrative boundary outside of designated wilderness).

The cumulative effects analysis for cultural resources considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: past management activities and current management activities. These actions were selected because past heritage resource monitoring activities within the project area have documented effects to heritage resource sites from these actions.

Analysis

Prior to the 1974 Forest and Rangeland Renewable Resources Planning Act (RPA), effects to heritage resources were not considered during project planning or implementation. Consequently, cumulative impacts of varying degrees occurred within the project area from various land management activities including logging, road construction, and hydroelectric development. Natural environmental processes and unrestricted land uses have also contributed to effects to heritage resources within the project area. These include dispersed recreation, OHV use, grazing, previous road and trail construction and existing road and trail conditions, wildfires, erosion, and exposure to the elements.

In addition, heritage resources have been primarily protected using “flag and avoid measures” during all project activities subsequent to the 1974 RPA, including projects such as timber sales and fire salvage. This management practice, which essentially deferred management, has resulted in unintended consequences as it contributed to unnatural and heavy fuel loading within site boundaries. It also resulted in high numbers of recorded cultural resource sites that have not been evaluated for eligibility for inclusion into the National Register of Historic Places. To be eligible for the NRHP, sites must meet the National Register Criteria (36 CFR 60.4). Sites not eligible may be released from management. Presently, there are many sites the ENF manages that may not be eligible.

It is anticipated that future project management activities will not affect cultural resources to a significant degree as these projects will be subject to NHPA Section 106 compliance and will include protection measures in the design and implementation of these projects. Future environmental effects will continue to degrade cultural resource sites in the project area such as erosion, wildfire, and exposure to the elements. Future unrestricted human activities will continue to degrade sites within the project area and include activities such as dispersed camping, vandalism, and looting

T. Law Enforcement

Affected Environment

The Forest Service is responsible for enforcing the Code of Federal Regulations (CFRs) at 36 CFR 261 that applies to the ENF. These CFRs cover a wide array of violations, ranging from very minor infractions that occur in developed recreation sites, to road and trail use infractions, to infractions concerned with disorderly conduct.

The Forest Service has several methods of enforcing compliance with the regulations applicable to the ENF. Forest Protection Officers (FPOs) are the primary personnel involved in enforcing regulation compliance. Forest Service law enforcement officers (LEOs), or Sheriff's office personnel, commonly handle more dangerous violations such as disorderly conduct.

The ENF has approximately 25 FPOs who can write warnings and citations as necessary to solicit compliance. The ENF also has five assigned field LEO positions, plus one LE supervisor/program manager.

To improve visitor compliance with regulations on the Forest, especially related to public wheeled motor vehicle use, the Forest has increased public education and outreach efforts over the past two years with improved website information, more frequent news releases and newsletters, more and better signs on the ground, and collaboration with public user groups. ENF LEOs also continue their efforts to collaborate with local Federal, State, and County law enforcement in order to improve law enforcement in the area. These efforts have improved compliance.

Analysis Framework

Data & Assumptions

For a list of data and assumptions used in this analysis see the discussion at the beginning of Chapter 3.

Indicator Measures

Indicator Measure 1: Law enforcement patrol needs, as measured by miles of roads and trails open for public wheeled motor vehicle use.

Indicator Measure 2: Prohibition of public wheeled motor vehicle cross-country travel.

Indicator Measure 3: Enforcement needs for enforcing a seasonal closure during wet weather periods.

Indicator Measure 4: Distance public wheeled motor vehicles are allowed off of open routes for parking and dispersed camping.

Environmental Consequences

Direct, Indirect, and Cumulative Effects for Alternative A

Indicator Measures 1-2: In this alternative, the existing condition would continue, as described in the description of Alternative A in Chapter 2. There would be no prohibitions for public wheeled motor vehicle use on existing routes, nor on cross-country travel. There would a higher percentage of available mileage of roads and trails open for public wheeled motor vehicle use, reducing the mileage of routes not open for public wheeled motor vehicle use that would have to be patrolled by FPOs and LEOs. However, the occurrence of route proliferation and resource damage on the Forest has continued under the current court order so having more mileage available for public wheeled motor vehicle use would not necessarily eliminate these problems. Law enforcement on the Forest to handle these problems would continue to be inadequate.

Indicator Measure 3: In this alternative, the existing condition would continue, and there would be no seasonal closure in effect across the Forest. Law enforcement efforts would focus primarily on reducing resource damage and damage to roadways during the wet weather periods.

Indicator Measure 4: In this Alternative, areas for dispersed activities would continue to be used by public motor vehicles primarily for the purpose of dispersed camping and parking. Route proliferation and resource damage as a result of public wheeled motor vehicle use in sensitive areas would continue and the ability to protect resources from damage on the Forest would continue to be inadequate.

Direct, Indirect, and Cumulative Effects for All Action Alternatives

Indicator Measures 1-2: In all action alternatives, fewer miles of roads and trails are open for public wheeled motor vehicle use and more miles of routes are not open for public wheeled motor vehicle use than in Alternative A, plus cross-country travel would be prohibited.

These factors will allow FPOs and LEOs to more strategically focus enforcement on open routes to prevent route proliferation and resource damage off of these routes, while still providing for education, information, and public safety. There will continue to be a need to maintain a level of law enforcement effort associated with routes not open for public wheeled motor vehicle use to prevent resource damage on these routes and route proliferation off of these routes. Future decisions for physical closure of routes not open to public wheeled motor vehicle use will reduce number or routes and mileage that needs to be patrolled.

In the short-term, it may be necessary for enforcement personnel to focus patrols, information, and sign maintenance efforts on routes not open for public wheeled motor vehicle use, since users are familiar with many routes that have been open in the past that would no longer allow public use. The primary goal would be to prevent use on, near, and off of these routes so that they can begin to naturally rehabilitate. As a result, the enforcement burden in the short-term (5 to 10 years) is likely to increase, and enforcement personnel on the Forest would need to develop new strategies for other enforcement needs or increase staffing levels. Following the initial implementation period, the enforcement and education burden should begin to shift as users become familiar with the new system and as new enforcement strategies become more effective. At this point, enforcement personnel could take a more balanced approach by enforcing routes open and not open for public wheeled motor vehicle use, as well as identified problem areas.

In addition to enforcement personnel levels and scheduling, the success of all action alternatives will also depend on the availability and readability of public maps that display the designated system, designated routes being clearly marked on the ground, effective public education about the route designation regulations, and ongoing efforts to install and maintain signs, barriers or other physical closures of routes not designated for use. If the Forest is successful in producing and maintaining these elements, then it will be easier for the public to comply with the new regulations, as well as for personnel to know whether a person is violating the regulations.

Indicator Measure 3: In all the Action Alternatives, there would be a seasonal closure from at least January 1 through March 31. Enforcement of this closure would require adequate signing and public notification, patrols, primarily on surfaced roads within the forest, and an ongoing public education effort. There will be an initial period in which compliance may be low, as the public notification and education efforts are begun, but it is anticipated that compliance will improve as the forest policy is implemented. Due to fewer roads and trails allowing public wheeled motor vehicle use, the need for patrols during the seasonal closure period will decrease as the closed roads and trails become physically blocked or gated. There will still be a need for some patrols to assure compliance with the seasonal closure.

Indicator Measure 4: In all Action Alternatives, parking would require all parts of the vehicle be within one vehicle length from the edge of the route surface when it is safe to do so and without causing damage to NFS resources or facilities (FSM 7716.1 (Proposed)). Public wheeled motor vehicle use of terminal facilities, trailheads, parking lots, and turnouts associated with a designated road or trail would also be allowed.

This policy would prevent route proliferation and resource damage in these areas, but would increase the enforcement burden in the short-term (5 to 10 years) until users become familiar with the regulations.

U. Recreation

The ENF Land and Resource Management Plan (LRMP) provides direction for performing on-the-ground activities, such as the Travel Management project. This management direction is used to achieve the desired future condition of the ENF. Forest goals attempt to describe the future condition that the LRMP is expected to achieve. The Forest recreation goal is to provide a wide range of developed and dispersed recreation opportunities that meet the projected demand. Additionally, stress simpler, more natural recreation experiences over dense, sophisticated developments.

Nearly all forest visitors, regardless of the purpose for their visit, use the motorized transportation system to reach their destination. Making changes to the existing forest transportation system to prohibit or allow motorized use has the potential to affect the majority of Forest visitors, including those participating in motorized recreation and those intending to access trailheads, facilities, destinations, or geographic areas that are utilized for non-motorized recreational activities.

This section analyzes the effects of implementing each of the alternatives on both motorized and non-motorized recreational activities.

Recreation Opportunity

The ENF currently hosts a wide range of motorized and non-motorized recreation experiences that occur year round. Motorized recreation involves the use of highway-licensed cars, sedans, sport utility vehicles (SUVs), dual-sport motorcycles, off highway vehicles (OHVs), motorcycles, all terrain vehicles (ATVs), snowmobiles, and four wheel drives (4WDs), including highly customized and specialized machines able to travel extreme terrain. Non-motorized recreational activities include hiking, camping, mountain bike riding, horseback riding, wildlife viewing, picnicking, rock climbing, hunting, fishing, recreational shooting, recreational panning and dredging, cross-country skiing, snowshoeing, downhill skiing and snowboarding, snow camping, and snow play. These opportunities are roughly depicted in the Recreation Opportunity Spectrum (ROS) mapping completed at the time the LRMP was developed.

Recreation Visitor Use

Visitor use estimates for the Forest[1] were generated based on the National Visitor Use Monitoring (NVUM) survey that was conducted from October 2002 to September 2003. The survey was designed to assess existing recreation demand on the Forest by asking visitors what they did during their visit, and visitors could check multiple activities. This resulted in two categories of visitor use, activities participated in and main activity, and highlighted the fact that the two may or may not be related. For example, over 60% of Forest visitors reported participating in the viewing of natural features but less than 3% reported that as their main activity. On the other hand, 40% reported participating in downhill skiing and 39% reported that as their main activity (Table 3-U.1).

[1] For more information about the National Visitor Use Monitoring (NVUM) program, go to the NVUM program website at: http://www.fs.fed.us/recreation/programs/nvum/

Table 3-U.1: ENF visits by participation and primary activity

Activity	Percent Participating	Percent as Main Activity
Viewing Natural Features	60.3	2.92
Relaxing	53.3	8.04
Hiking / Walking	39.83	11.57
Downhill Skiing	39.69	38.73
Viewing Wildlife	36	0.26
Driving for Pleasure	19.64	1.55
Other Non-motorized	16.94	5.73
Fishing	16.22	9.23
Developed Camping	14.28	4.96
OHV Use	7.37	3.34
Primitive Camping	6.76	1.36
Nature Study	6.46	0.08
Hunting	4.62	3.82
Gathering Forest Products	4.37	1.38
Non-motorized Water	4.12	1.35
Motorized Water Activities	4.07	0.8
Picnicking	3.7	0.39
Cross-country Skiing	2.98	1.42
Bicycling	2.86	0.79
Visiting Historic Sites	2.41	0
Backpacking	2.13	1.61
Resort Use	2.03	0.43

As Reported In NVUM Results (2004)

While access to all types of recreation is recognized as the most common motor vehicle use, it was reported that an estimated 20% of visits involved driving for pleasure, while 7% of visits involved OHV use. OHV use as the primary activity was estimated for only 3% of visits. Conversely, an estimated 40% of visits involved hiking/walking in the Forest with 12% of visits reporting hiking/walking as the primary activity (USDA Forest Service 2004).

Based on the reported 2,116,479 public visits to the ENF during fiscal year 2003, this would mean that 415,676 visits involved driving for pleasure, 155,985 visits involved the use of OHVs, and the primary activity for 70,690 visits to the ENF was OHV use. Additionally, 842,994 visits involved hiking or walking and the primary activity for 244,877 visits to the ENF. When primary motorized uses are combined, including OHV use, driving for pleasure, and other motorized activities, the approximate number of visits is 105,189, or 5%, compared to 625,420 visits, or 30%, for primary non-motorized uses combined, including backpacking, fishing, hiking/walking, horseback riding, bicycling, and other non-motorized activities (Table 3-U.2).

Table 3-U.2: Approximate ENF visits by type of main activity

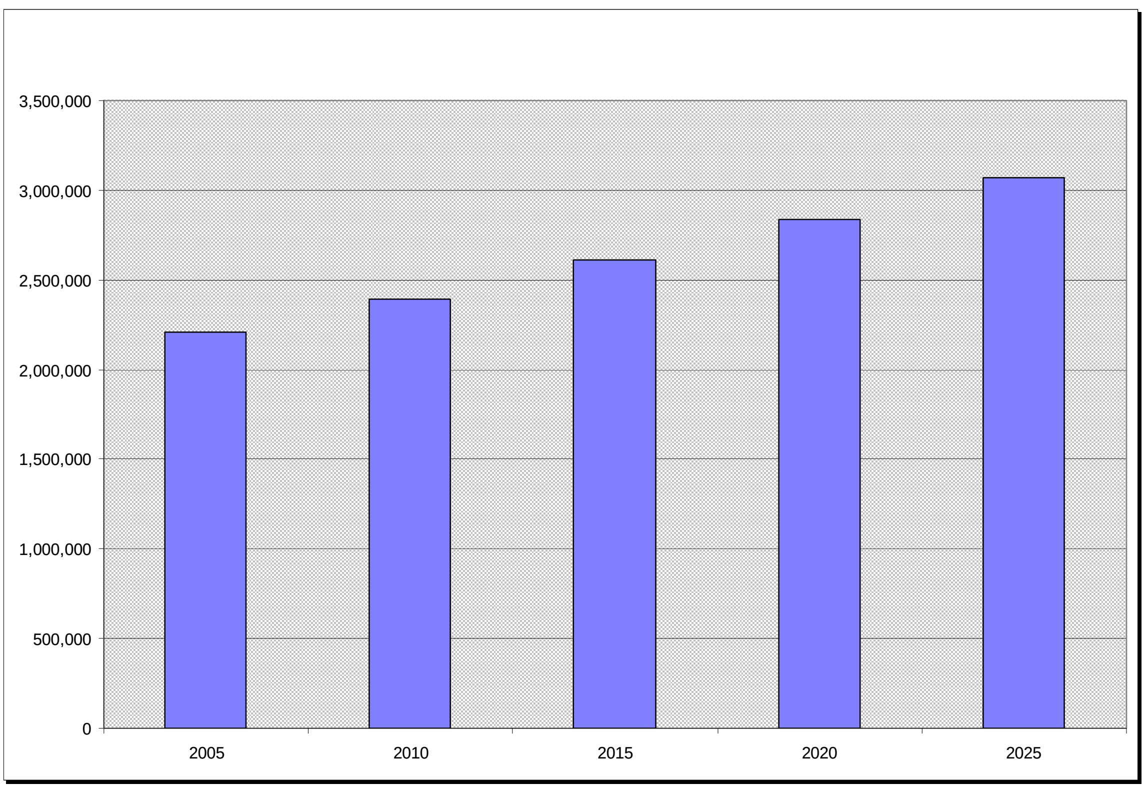
Type of Use	NVUM Categories	Percent as Main Activity	Approximate Visitors in 2003
Camping	Developed Camping Primitive Camping	6.32%	133,762
Hunting	Hunting	3.82%	80,850
Motorized Uses	OHV use Driving for Pleasure Other Motorized Activity	4.97%	105,189
Non-motorized Uses	Backpacking Fishing Hiking/Walking Horseback Riding Bicycling Other Non-Motorized Activities	29.55%	625,420
Other Activities	Resort Use Picnicking Viewing Natural Features Visiting Historic Sites Nature Center Activities Nature Study Relaxing Gathering Forest Products Viewing Wildlife	13.5%	285,725
Water Sports	Motorized Water Activities Non-motorized Water	2.15%	45,504
Winter Sports	Downhill Skiing Cross-country Skiing Snowmobiling	46.14%	862,465

Recreation Market Zone

In order to better serve our visitors recreation needs, it was necessary to determine where our visitors come from, also known as our recreation market zone. Our recreation market zone was derived from NVUM data that considered the average distance traveled to the Forest and the percent of visitation from each county of residence. The 50 percent market zone comprises the counties that account for approximately half of ENF visits and consists of the following: Alpine, Amador, Calaveras, Carson City (NV), Douglas (NV), El Dorado, Lyon (NV), Placer, Sacramento, and Yuba counties (Harbin 2007). This indicates that the majority of our visitors are coming from the local surrounding counties and the Sacramento area and that the predominant recreation activities in those surrounding counties are similar to use on the Forest

The population in the ENF market zone is expected to reach almost 9 million people by the year 2030. This represents about a 75% increase in population from 2000 to 2030. According to a study by the USFS Southern Research Station, the increase in the market zone population would result in 43,000 more visitors each year so that by 2025 Forest visitation would be over 3 million visits (Harbin 2007). This 40% increase in visitation between 2005 and 2025, shown in Figure 3-U.1, differs from the overall population growth because not all people recreate on the Eldorado National Forest.

Figure 3-U.1 Predicted Increase in Visitation on the ENF



Analysis Framework

Recreation Settings Overview

The LRMP's Recreation Opportunity Spectrum (ROS) roughly depicts the variety of recreation opportunities available on the Forest. As a means to better describe these opportunities forest-wide, while accounting for variation in patterns related to types of use and concentration of use, seven distinct recreation settings have been recognized and utilized. These recreation settings are based on the ENF Recreation Strategy and are generally consistent with those integrated into the draft Forest Recreation Program Niche. The recreation settings are not land allocations, nor are they included in the LRMP. Therefore, they are not connected to management prescriptions, standards and guidelines, or other management directions; however, the spectrum of ROS classes established in the LRMP remain consistent with these settings.

The settings include: High Country, Scenic Corridors, System Ride and Play, Traditional Use, Water Focus, Wilderness and Primitive Backcountry, and Wildland Urban Interface, as shown in Map 8 and Table 3-U.3 below. Each of these recreation settings has been generally characterized by typical route density, motorized experience, and recreation opportunities found in the areas associated with the setting; and are used to provide geographic context to Indicator Measure 1 below. Road and trail conditions vary considerably in all areas due to soils, landscape, type and frequency of use, and past funding limitations on maintenance and reconstruction. The degree to which noise and other artifacts of forest uses exists, including recreation, are expected to vary across the settings (Harrison 1980). A detailed description of these settings is available in the project record.

Table 3-U.3: Typical characteristics of the recreation settings on the ENF

Recreation Setting	Typical Route Density/Types of Recreational Motor Vehicle Use	Typical Route Traits/Characteristics	Typical Recreation Opportunities
High Country	Low to moderate route density. Uses include motorcycles, ATVs and 4WD (including SUVs).	Travel may be slow and technical in places. Few connectors and loops available. Short spurs to campsites and remote destinations are not uncommon. Modern sounds are expected to be less frequent, yet present.	Camping, hunting, driving/riding for pleasure and access for hiking, equestrian use and other specialized activities. Self-sufficient single day to multi-day travel is possible.
Scenic Corridors	Low to moderate route density. Primarily highway legal vehicles only. Connector routes lead from main highways providing access to other areas of the Forest.	Main features are trans-sierran highways which bisect the forest, providing access to main forest roads. Expect modern sounds.	Driving/riding for pleasure primarily with highway legal vehicles, viewing natural features, access for hiking, picnicking, fishing, rock climbing, and other specialized activities. Through travel.

Recreation Setting	Typical Route Density/Types of Recreational Motor Vehicle Use	Typical Route Traits/Characteristics	Typical Recreation Opportunities
System Ride and Play	Moderate to high route density. Uses include motorcycle and/or ATVs.	Areas with trail systems; connectors and loops emphasized; short spurs to dispersed campsites and day use destinations not common. Multiple staging areas to provide access to trails. Modern sounds are frequent.	Primary use is motorized road and trail opportunities, and compatible non-motorized opportunities. Day use and multi-day use, generally associated with trail opportunities is prevalent.
Traditional Use	Low to moderate route density. Uses include motorcycles, ATVs, 4WD and high clearance passenger vehicles.	Moderate difficulty travel (including 2WD/high clearance vehicles). Connectors and loops are not emphasized. Short spurs to dispersed campsites and day use destinations not uncommon. Expect modern sounds. Travel is primarily on roads, rather than on trails.	Camping, hunting, travel for pleasure (including technical travel), and collection of forest products. Single day and multi-day travel opportunities available. Some visitors use developed campgrounds and other facilities for base camp. Dispersed camping is common.
Water Focus	Moderate density of roads. Motorized recreation by OHVs is not emphasized.	Majority of roads designed for regular passenger car use. Some high-clearance roads exist. Few motorized trails. Modern sounds are common.	Diverse use includes a wide range of water and land based non-motorized and motorized activities. Developed recreation facilities predominate the opportunities near water features. Dispersed camping opportunities are available. Day use and multi-day use is most often associated with the large reservoirs in the areas.
Wilderness & Primitive Backcountry	Few to no motorized routes. No motorized routes are located within designated wilderness areas.	Corridor or access adjacent to non-motorized or inaccessible areas. Modern sounds are infrequent to non-existent.	Hiking or equestrian use in wilderness areas. River canyon gorge recreation may also include rafting, kayaking, fishing and swimming.
Wildland Urban Interface	Moderate density of roads, low density of motorized trails. Motorized recreational opportunities are not emphasized.	Roads of two types; either designed for regular passenger car use (such as major highways or access to recreation residences) or for forest management (high clearance vehicles). Modern sounds are frequent.	Intermixed private and public lands. Area is not emphasized for motorized recreation, although some travel for pleasure does occur. Many other forms of recreation (including special uses and non-motorized uses) and non-recreation uses (residential, commercial, utilities, etc.) do occur.

Assumptions

For a list of the assumptions used in this analysis see the discussion at the beginning of Chapter 3, Assumptions section.

Indicator Measures

For analyzing the effects of designating a system of routes by vehicle class and season of use, seven indicator measures were used. Mileage available for each class of vehicle is useful in analyzing the ability of Forest users to not only travel around the Forest and enjoy motorized recreation but also to access non-motorized recreation activities, such as trailheads and hunting and fishing spots. Trail mileage for motorized recreation is an indicator of the number and types of experiences available for motorcycles, ATVs, and 4WDs in each alternative. The changes to motorized and non-motorized trail mileage can be used to interpret the level of change in opportunities for motorized and non-motorized trail users. The details of the proposed seasonal closure relate both the months that motorized recreation will not be allowed to use native surface roads and trails and, conversely, the time of year that conflicts between motorized and non-motorized uses will be minimized. Also, the effect on non-motorized recreation activities that are accessed by native surface roads is considered. Over the snow travel (OST) is a popular recreation activity on the ENF. Analyzing the mileage available for OST can indicate the opportunity for engaging in this activity as well as the potential for conflict between motorized and non-motorized winter recreation. The percent of inventoried dispersed sites within 300’ of roads and trails is useful for indicating the ease of access for both motorized and non-motorized dispersed recreation. Ease of use for dispersed campsites and day use areas has been categorized based on distance from proposed roads and trails as: Very Easy: 0-50 feet, Easy: 50-100 feet, More Difficult: 100-200 feet, and Most Difficult: 200-300 feet. Dispersed sites located further than 300 feet from proposed roads and trails were considered to be not accessed by the proposed system. Dispersed camping and day use areas located within 500 feet of a water source are considered to be used for general recreation, while sites located further than 500 feet from a water source are considered to be used primarily for hunting and as overflow camps. Number and size of acres located away from roads and trails is used to analyze the opportunity for quiet recreation on the Forest.

Indicator Measure 1: Percent of mileage available by class of vehicle.

Indicator Measure 2: Trail mileage available for motorized recreation forest-wide by type of use.

Indicator Measure 3: Types of use changes affecting current existing NFS motorized and non-motorized trail mileage.

Indicator Measure 4: Mileage affected, duration, and time of year of seasonal closure.

Indicator Measure 5: Mileage available for public wheeled motor vehicle over-the-snow travel.

Indicator Measure 6: Percent of inventoried dispersed sites within 300’ of public wheeled motor vehicle access and within 300’ of water.

Indicator Measure 7: Number of areas 25-75 acres, 75-200 acres, 200-500 acres, and greater than 500 acres on NFS land located farther than 0.25 mile, 0.5 mile, 1 mile, or 2 miles from roads and trails open for public wheeled motor vehicle use.

Environmental Consequences

Direct and Indirect Effects for All Alternatives

Indicator Measure 1: Visitors should expect that the potential recreation experience may differ greatly among the alternatives, which contain routes ranging from high standard surfaced roads already designated for public highway-licensed wheeled motor vehicle use to roughly graded native surface roads and trails. Table 3-U.4 displays the percent of mileage available in each alternative for different classes of vehicle. As the table illustrates, all the action alternatives have a general decrease in mileage for all motorized uses from that included in Alternative A. Management of the systems proposed in all action alternatives will represent a change from the current condition. This will result in adverse impacts to motorized recreationists as cross country travel and use on previously open routes is prohibited in all action alternatives.

Table 3-U.4. Percent of total open mileage available in each alternative forest-wide for different classes of vehicles*

Class of Vehicle	A		B		Mod B		C		D		E	
	Mileage	%	Mileage	%	Mileage	%	Mileage	%	Mileage	%	Mileage	%
Total Miles Open	2,868	100%	1,847	100%	1,847	100%	1,730	100%	1,548	100%	1,330	100%
Passenger car	2,623	91%	1,605	87%	1,637	89%	1,553	90%	1,332	86%	1,199	90%
OHV 4WD	1,945	68%	867	47%	971	53%	637	37%	482	31%	370	28%
OHV ATV	1,969	69%	916	50%	1,008	55%	668	39%	529	35%	404	30%
OHV motorcycle	2,180	76%	1,049	57%	1,123	61%	757	44%	642	41%	487	37%
High clearance vehicle	2,633	92%	1,665	90%	1,695	92%	1,610	93%	1388	90%	1,213	91%

* Mileage includes ML-3, -4, and -5 roads already designated for highway-licensed public wheeled motor vehicle use. Does not include mileage in the Rock Creek Recreational Trails Area. The mileages displayed in the table for Alternative A include 1,008 miles of roads and trails that are not open by policy, but that are currently being used by the public, as described in Chapter 2. The mileages shown for Alternatives B through E only include miles of roads and trails that are to be managed as open to different classes of vehicles..

Indicator Measure 2: The quality of experience for motorcyclists is greater on single-track trail than on ATV trail or road, where the trail tread or road bed is wider and can be rutted by the use of 3- or 4-wheel vehicles in patterns that are inconsistent with the travel of motorcycles. Wider trail treads and road beds, like those on ATV and 4WD trails, give less experienced riders the confidence to increase their speed, escalating the potential for accidents. Single-track trails on the other hand require riders to slow down and maneuver through twists and turns, and provide for a higher quality trail riding experience. Table 3-U.5 shows the NFS motorized trail mileage available in each Alternative for different uses. Numbers for the alternatives include mileage for NFS trail routes which are coincident with roads.

Table 3-U.5: Trail mileage available for motorized recreation forest-wide by type of use*

Type of Use	A	B	Mod B	C	D	E
Open to Motorcycles Only	211	133	115	89	113	83
Open to ATVs and Motorcycles Only	24	49	37	31	47	34
Open to 4WD, ATVs. and Motorcycles	10	60	58	57	56	13
Total Motorized Trail Mileage	245	242	210	177	216	130

*Does not include the 58.6 miles of motorcycle trail and 13.0 miles of motorcycle and ATV trail available in the Rock Creek Recreational Trails Area

Indicator Measure 3: In some cases, NFS trails currently managed for motorized uses are not proposed to be open for public wheeled motor vehicle use in the action alternatives. Conversely, NFS trails presently managed for non-motorized uses are proposed open for motorized use. In Alternatives Modified B, C, D, and E, the existing NFS non-motorized trail mileage proposed for motorized use does not offset the loss of existing NFS motorized trail mileage not proposed for motorized use (Table 3-U-6). However, Alternative B does offset the loss of existing NFS motorized trail mileage and results in an increase of 3.2 miles of motorized trail mileage. Thus, the adverse affects on motorized recreation decreases in Alternatives E, C, D, and Modified B, respectively, as the mileage reductions in trail riding opportunities decreases. Conversely, Alternative B benefits motorized recreation as trail riding opportunities are increased.

Table 3-U.6: Types of use changes affecting current existing NFS motorized trail mileage

NFS Trail Types of Use Change	A	B	Mod B	C	D	E
NFS motorized trail not designated for motorized use	0.0	7.1	10.3	39.4	15.5	47.3
NFS non-motorized trail designated for motorized use	0.0	10.3	1.7	0.0	1.7	1.2
Net change in motorized trail[a]	0	3.2	- 8.6	-39.4	-13.8	-46.1

[a]A positive number means a net increase in motorized trail opportunities, while a negative number means a net decrease in motorized trail opportunities.

As part of the present NFS trail system on the ENF, approximately 374.9 miles of non-motorized trails exist. Of these, approximately 140.6 miles are located within the designated wilderness areas where mechanized travel is prohibited. In addition, non-motorized users may also recreate on any road or trail where motorized use is allowed, as well as travel cross-country. The quality of experience along such roads and trails may be diminished for non-motorized users when motorized use is present. In some cases, multiple-use trails which mix motorized and non-motorized uses have been a source of conflict on the Forest. For example, along Hunter's Trail (14E09) in the Georgetown North - Upper Rubicon area, non-motorized users have cited noise, dust, and trail degradation as the basis of conflict.

Indicator Measure 4: Both motorized and non-motorized recreation will be affected by seasonal closures on all designated NFS ML-2 roads and motorized trails proposed in the action alternatives for public highway-licensed wheeled motor vehicle use (Table 3-U-7). Under these restrictions, public wheeled motor vehicle use will be limited to NFS ML-3, -4 and -5 roads only during the dates proposed. This will have the greatest adverse impact on recreation for OHV users, but will also adversely impact other visitors who use highway-licensed vehicles on NFS ML-2 roads and NFS motorized trails during these time periods to access trailheads, dispersed sites, and other locations for hiking, horseback riding, fishing, hunting, camping, and other recreational activities.

Table 3-U.7: Seasonal restriction: Dates, duration, and designated NFS motorized trail and NFS ML-2 road mileage closed

Alternative	Restriction Dates	Duration	Mileage Closed
A	N/A	0 months	0
B	January 1 to March 31	3 months	1,362
Mod B	January 1 to March 31	3 months	1,212
C	November 1 to April 30	6 months	1,245
D	December 1 to April 30	5 months	1,063
E	January 1 to March 31	3 months	845

Indicator Measures 5: Public wheeled motor vehicle over the snow travel (OST) provides recreationists an opportunity to experience the Forest when fewer visitors are present and the forest landscape is changed by snow and ice. This allows visitors to enjoy social experiences with friends and families while experiencing the Forest in a unique way.

The seasonal closure that has been proposed in all of the action alternatives will adversely affect the ability of recreationists to participate in wheeled OST with both OHVs and highway-licensed vehicles prohibited from traveling on all native surface roads and trails, except in Alternative D where travel on native surface roads would be allowed with 24" of snow and no ground contact. The Alternative descriptions in Chapter 2 identify the conditions and routes in which wheeled OST recreationists using highway-licensed vehicles or OHVs can access snow covered roads.

Highway-licensed vehicles operating on ML-3, -4, and -5 roads are not restricted by snow depth in any Alternative. OHV use, however, will only be allowed on designated surfaced ML-3, -4, and -5 roads when snow depths meet the requirements specific to each of the action alternatives. The proposed seasonal closure will minimize conflicts between winter non-motorized recreation and winter motorized travel because wheeled motor vehicle travel will be prohibited on NFS non-motorized winter trails and thus will not tear up the trail by creating ruts and grooves inconsistent with ski and snowshoe tracks. All action alternatives prohibit wheeled OST on NFS cross country ski trails, snowshoe trails, and groomed snowmobile trails forest-wide, in addition to the following specific road segments:

Mormon Emigrant Trail (10N50/Forest Route 5) from the junction of Silver Fork Road (11N40) southeast to the Iron Mountain SnoPark at Highway 88
Robbs Peak Road (13N31)
Loon Lake Campground Road (13N17)
Chipmunk Bluff Road (13N19)

Indicator Measure 6: Visitors selecting dispersed recreation areas, rather than developed areas, surveyed on three Pacific Northwest national forests, reported they viewed highly developed areas as overcrowded, noisy, expensive, and too developed. These visitors preferred the characteristics of roaded, dispersed areas, including the lack of development, fees, regimentation, control, and greater privacy and the freedom to engage in activities not appropriate in developed locations, such as OHV use, bringing along a noisy dog, and altering the site to meet their needs (Clark et al. 1984). In addition, dispersed sites provide large group members better opportunity to camp in close proximity to each other, and away from others, than do most developed group campgrounds.

A NVUM survey of visitors to the ENF resulted in a visitor use estimate for primitive camping as a primary activity of 6.7 percent of Forest visits. Dispersed day use, however, is more prevalent than dispersed overnight use (Clark et al. 1984). A wide range of activities can be associated with both dispersed camping and day use, including but not limited to, backpacking, picnicking, fishing, hunting, OHV use, hiking/walking, horseback riding, cycling, and gathering of forest products, any of which may have been reported as the primary activity for the visit (see Table 3-U.2).

The action alternatives have the potential to reduce motorized access to dispersed sites across the Forest, resulting in reduced access to dispersed use areas by motor vehicles (Table 3-U.8). Parking of motor vehicles for dispersed camping and day use will be limited to within one vehicle length of designated roads and trails, as is consistent with the Travel Management Rule (36 CFR Parts 212, 251, 261, and 295). In locations where a designated route does not immediately access a desired dispersed camp or day use area, visitors will need to park further from the site and travel by foot or other non-motorized means to the location, hauling their gear by similar means. Decreased direct motor vehicle access to dispersed use areas will directly impact recreationists with campers and trailers, limiting their choices in camping locations to the designated system. Also, Forest visitors less able to walk distances will be impacted by the reduction of motorized routes leading to dispersed recreation sites.

Motor vehicle access to dispersed campsites is reduced in all action alternatives (Table 3-U.8. The action alternatives result in a relative decrease in number of dispersed camping sites within 300 feet of motor vehicle access by between 17 to 32%, compared to Alternative A. Modified B poses the least impact to dispersed camping access followed by Alternatives B, C and D which would cause similar impacts. The greatest impact to dispersed camping access is Alternative E.

Table 3-U.8: Inventoried dispersed sites

Alternative	Within 300’ of motor vehicle access	Within 300’ of motor vehicle access and 300’ of water
A	81%	43%
B	58%	33%
Mod B	65%	37%
C	57%	32%
D	55%	32%
E	49%	28%

In all action alternatives, access to dispersed sites located within 300 feet of water has decreased by 6 to 15%. This distance, while highly desirable to recreationists, corresponds with the extent of riparian conservation areas (RCAs) for perennial streams, lakes, and ponds, which are provided with protections in the ENF LRMP and the Sierra Nevada Framework. These protections and management direction are discussed in the Hydrology, Terrestrial, and Aquatic Wildlife sections.

Indicator Measure 7: Those seeking a quiet non-motorized recreation experience will be most successful when traveling on non-motorized trails or cross-country, distancing themselves from roads and motorized trails. Noise can be a major factor on the non-motorized recreation experience. A person’s response to noise is not based solely on decibel levels but is also a reaction to the meaning and significance attached to it, as well as it’s judged appropriateness for the setting (Kariel 1990). Since distance is the best way to reduce noise levels, the evaluation of potential noise impacts to quiet recreation users forest-wide utilized the distance from proposed motorized routes as the main measure of potential impact. This, coupled with the size of the areas available for quiet recreation experiences relative to varying distances, will indicate the opportunities for visitors to experience a non-motorized setting and sense of solace in each alternative.

A comparison of the alternatives is presented identifying the number of areas on the ENF located more than one-fourth mile, one-half mile, one mile, and two miles from roads and trails proposed for motor vehicle use. The areas are classified as 25-75 acres, 75-200 acres, 200-500 acres, and greater than 500 acres in size (Table 3-U.9). The greatest potential for conflict between motorized uses and those seeking a quiet recreational experience would be in locations within one-fourth mile of a road or trail when vehicle use is present. Noise from motorized vehicles is detected less than 5 percent of the time at a distance of one-half mile, lessening at the one mile range, and becoming non-existent in most cases by the two mile range (Harrison 1975).

Table 3-U.9: Number and size of areas located ¼, ½, 1, and 2 miles from motorized roads and trails*

Area Size (acres)	A	B	Mod B	C	D	E
Located farther than 0.25 mile from roads and trails						
25-75	79	113	112	112	104	103
75-200	54	64	62	66	78	71
200-500	28	49	55	48	65	66
> 500	38	60	55	55	61	58
Total	199	286	284	281	308	298
Located farther than 0.5 mile from roads and trails						
25-75	25	43	47	44	51	44
75-200	16	35	33	32	38	38
200-500	13	27	26	26	32	34
> 500	15	29	26	28	33	31
Total	69	134	132	130	154	147
Located farther than 1 mile from roads and trails						
25-75	2	13	9	12	14	14
75-200	1	10	9	11	13	14
200-500	0	8	8	8	8	7
> 500	10	11	12	9	12	8
Total	13	42	38	40	47	43
Located farther than 2 miles from roads and trails						
25-75	0	5	4	4	4	4
75-200	0	2	2	2	2	2
200-500	0	1	0	2	1	1
> 500	2	2	3	2	2	3
Total	2	10	9	10	9	10

*Modeled after the methodology used in the noise analysis of the Ocala National Forest Travel Management EIS (2005)

All of the action alternatives would result in an increase in all area size classes located more than one-fourth mile, one-half mile, one mile, and two miles from roads and trails proposed for motor vehicle use. The number of areas located away from roads and trails substantially increases by 80 to 400 percent in the 0.5, 1, and 2 mile size classes in all action alternatives compared to Alternative A. The relative increase is inversely proportional to the size class, where greatest relative increase is in the 2 mile size class and the smallest relative increase is in the 0.25 mile size class. This increase in the number of size classes, especially located more than one-fourth and one-half mile from roads and trails, will positively impact those seeking a quiet non-motorized recreation experience.

Direct and Indirect Effects

Alternative A (No Action)

Motorized Recreation

Alternative A includes the most motorized road and trail mileage of all the alternatives (2,868 miles) and cross-country travel on 502,000 acres is not prohibited. Since no change is proposed to the managed use of existing NFS roads and trails, this alternative results in the least impact to motorized recreation.

This alternative proposes the highest mileage of both motorized trail (245 miles) and motorcycle only trail (211 miles) for all alternatives. It is the only alternative with no seasonal closure. This alternative allows the greatest mileage of motorized mixed use on native surface roads of all alternatives (1,935 miles) and is the only alternative which continues to allow motor vehicle use on ML-1 roads.

Over-all, this alternative provides the greatest number of miles open to motorized recreation of all alternatives. Since it represents the existing condition, few adverse impacts are incurred by motorized recreationists. The roads and trails, however, vary greatly in condition and the quality of recreational experience provided. In some areas, visitors may have difficulty making sense of, and navigating, the dense web of roads. This alternative does not represent a cohesive, designed, or well-managed recreation system.

The proposed system in this alternative appears to have inflated road and trail mileages in some areas. This is a result of data included in the GIS layer representing old quadrangle map information or newer GPS data for unauthorized routes which may have been obliterated during restoration efforts or abandoned and revegetated. Therefore, some roads and trails that do not exist on the ground have been included in this alternative even though public motor vehicle recreation would not be possible. The result is that the difference in mileage between this alternative and the action alternatives is exaggerated.

Recreation Settings

The No Action alternative does not have any significant effects on the recreation settings as described in the Affected Environment of this Recreation section.

Wheeled OST

Wheeled OST on designated NFS roads in Alternative A is not restricted by snow depth, and cross-country travel is allowed. This alternative provides visitors with the greatest number of miles for wheeled OST and the most diverse experience.

Dispersed Recreation

Alternative A provides the greatest amount of access to dispersed use areas, including 974 inventoried sites that are within 300 feet of a road or trail. Approximately 43% of the inventoried dispersed sites are within 300 feet of a road or trail and within 300 feet of a stream or lake. This alternative represents the least adverse impact to dispersed recreationists. Of the inventoried dispersed use sites, 19 percent are more than 300 feet from an existing road or trail. Of these, 61 percent are categorized as general recreation sites, while the remaining 39 percent would be considered hunting or overflow sites.

Non-motorized Recreation

No conversion of NFS non-motorized trail to motorized trail is proposed in this alternative resulting in no change in current adverse impacts to non-motorized users of the existing NFS trail system. This alternative allows public motor vehicle use on the largest number of ML-1 roads, potentially diminishing the quality of experience for non-motorized users of these roads.

This alternative does not prohibit wheeled OST use on cross country ski and snowshoe trails coincident with designated routes. Wheeled OST use on NFS winter trails coincident with roads will adversely affect non-motorized winter uses along the trails by destroying the snow pack creating the trail tread.

Noise

In Alternative A, there would be 199 areas 25 acres or more in size further than 0.25 miles from roads and trails on NFS land (Table 3-U.9). The majority of these areas fall in the 25-75 (79) and 75-200 (54) acre categories. As the distance from the roads increases, the number of areas decreases with only 69 located further than 0.5 mile, 13 located further than 1 mile, and 2 located further than 2 miles from roads and trails.

In most cases, visitors looking for a quiet recreation experience in Alternative A will occasionally detect motor vehicles during their trip, with the greatest potential of impact to those recreating in the System Ride & Play, Traditional Use, and Wildland Urban Interface recreation settings where traffic is more frequent. Travel well within the wilderness areas will be necessary for the complete success in avoiding wheeled motor vehicle noise.

Alternative B

Motorized Recreation

Alternative B has the second most motorized road and trail mileage of all action alternatives (1,847 miles), equal to Modified B, providing the most motorized access in support of all recreation activities. This alternative provides the second highest total mileage open to OHV use (1,123 miles) and the third highest percent of total mileage (57 percent) open to OHV use of the action alternatives. Forest wide, this alternative proposes the second highest mileage for motorized trails (242 miles) with motorcycle trail mileage (133 miles) greatly exceeding ATV trail mileage (49 miles) and 4WD trail mileage (60 miles). The increase in trail mileage is the result of converting native surface roads to trails, particularly for 4WD use. Additionally, this alternative proposes the most ATV trail mileage of all alternatives.

Alternative B has the highest mileage of existing NFS non-motorized trail proposed for motor vehicle use (10.3 miles) and the lowest mileage of existing NFS motorized trail not proposed for motorized use (7.1 miles) of the action alternatives.

Alternative B includes a 3 month seasonal closure from January 1 to March 31. The proposed seasonal closure is the least restrictive presented in the action alternatives and will cause the least adverse impact to recreationists.

Recreation Settings

High Country: Alternative B decreases route density overall in the High Country areas.

- No motorized routes are proposed within Indian Valley in the Blue Lakes area. As a result, this area will only be accessible by non-motorized travel, such as hiking, horseback riding and mountain biking. This will adversely impact access to the southern end of the valley and the Mokelumne Wilderness boundary for motorized recreationists and local residents. Access into Little Indian Valley is proposed for highway legal vehicles only. Limiting travel to highway legal vehicles only on the 0.6 mile route will inconvenience hunters and others who use OHVs here, but will still provide motor vehicle access to dispersed campsites and hunting areas.

- Additional OHV use is limited in the Blue Lakes area to two NFS routes; along NFS road 09N01 (Blue Lakes) from ALP-5, to the parking area located approximately 0.30 mile from Meadow Lake, and the Clover Valley 4WD road (09N83) which has been proposed as NFS 4WD trail.

- This is the only alternative in which the managed use of Allen Camp Trail (17E19) is proposed to be changed from motorcycle to ATV. While this change affects the nature of the trail for motorcyclists, it provides a link for ATV users from the Silver Lake and Plasses Resort area to Mud Lake Road (17E24/09N04), Squaw Ridge (17E24/09N82) and Bear River Reservoir.

- Picket Fence Trail (NST1712-A and NST1716-A) is not proposed for motorized use in any of the action alternatives.

- Schneider Camp 4WD road (10N13, Strawberry 4WD) has been proposed to be converted to NFS 4WD trail. This has no effect on motorized recreation.

- In this alternative only, South Fork Trail (14E14) and Parsley Bar trail (14E10), currently managed as NFS non-motorized trails have been proposed as NFS motorcycle trail. This positively impacts motorcyclists, increasing the trail riding opportunities in the area by adding trail mileage and creating an additional loop.

Scenic Corridors: Alternative B maintains the over all function of motorized travel in the scenic corridors, but decreases the number of short side roads available for general public motor vehicle use.

- Many of the short roads adjacent to Highway-50 associated with the many recreation residences under special use permit in the corridor that are proposed in Alternative A are not proposed for public use in Alternative B. These roads will be closed to the public but could still be used in conjunction with the special use permit with an additional permit or modification to the current special use permit authorized by the Forest Service (see Special Uses section).

- The proposed change in managed use of a short segment of the Thunder Mountain Loop (17E22) improves access for motorcyclists. This route connects the Martin Meadow campground to the Horse Canyon Trail (17E21), allowing access to Squaw Ridge (17E24/09N82) and Bear River Reservoir.

System Ride & Play: Alternative B includes a high density combination of roads and trails in System Ride & Play areas providing for short and long loops and a range of recreational riding challenges.

- Adding specific unauthorized routes to the NFS trail system in this alternative will enhance the Gold Note and Elkins Flat areas.

Traditional Use: Alternative B decreases road density from Alternative A but still contains a dense system of roads.

- The series of parallel NFS ML-1 roads north of Capps Reservoir road (09N30) and south of Baltic Ridge 4WD (NSR1046-A) are not proposed for public motor vehicle use in this Alternative. Capps Reservoir road (09N30) and a few dispersed camping spurs are proposed open to highway legal vehicles only. This will adversely impact OHV users.

Water Focus: Alternative B decreases the overall route density in the Water Focus setting.

- The Barrett Lake 4WD road (11N26F) has been proposed to be converted to NFS 4WD trail.

- In the Mokelumne Canyon – Bear River area, the Sugar Pine Point road (08N20) from the Sugar Pine Point campground to Sugar Pine Tie road (08N21) is not proposed for motorized use.

This section of road received extensive storm damage in recent years and has been considered in the past for relocation due to its contribution to sediment delivery to the watershed. Unauthorized route NST1640-A combined with NFS road 08N19 (Little Bear) are proposed as ATV trail and provide access from Bear River Reservoir to the same areas as did 08N20. The exclusion of road 08N20 and the loss of the loop opportunity will negatively impact 4WD users, as well as ATV and motorcycle users.

Wilderness and Primitive Backcountry: Alternative B generally decreases the number of roads and motorized trails within primitive backcountry areas, impacting motorized users of the Lower Rubicon and Caples Creek Proposed Wilderness areas.

- This alternative does not propose motorized use on the Old Silver Lake Trail (17E71) and the Silver Fork Trail (17E20) in the Caples Creek Proposed Wilderness.
- Motorcycle use is proposed on the entire Caples Creek Trail (17E51), creating a through route from the trailhead at Silver Fork Road (11N40) to Mule Canyon (10N14) and accessing Buck Pasture (17E17), Little Round Top (17E16), and Strawberry Canyon 4WD (10N13).
- A 0.9 mile segment in the Caples Creek Proposed Wilderness Area, at the beginning of NFS non-motorized trail 17E63 (Forgotten Flat), is proposed for motorcycle use in conjunction with an unauthorized trail originating from Highway 88 near Silver Lake. The inclusion of this trail provides motorcyclists a northerly route from the Highway 88 corridor.

Wheeled OST

Alternative B proposes to limit wheeled OST use to ML-3, -4 and -5 roads with no cross-country wheeled OST. The will adversely impact winter motorized recreation as use is not allowed on native surface roads and cross country travel is prohibited.

Dispersed Recreation

Alternative B would have the second least impact to dispersed recreation of the action alternatives. This alternative provides access to 58 percent of the dispersed sites inventoried, a reduction of 28 percent of the dispersed sites accessible in Alternative A. This alternative provides access to 23 percent fewer dispersed sites than Alternative A that are within 300 feet of a road and within 300 feet of a stream or lake.

Non-motorized Recreation

In Alternative B, the number of NFS ML-1 road miles not proposed for public motor vehicle use nearly doubles from that of Alternative A. This is the only alternative where the NFS non-motorized trail mileage proposed for motorized use exceeds that of the NFS motorized trial mileage not proposed for motorized use. Conversely, even though NFS ML-1 roads not open for wheeled motor vehicle use are not managed or maintained as non-motorized trails, they still may provide some non-motorized recreation opportunities, at least until the routes revegetate.

A total of 10.3 miles of NFS non-motorized trail has been proposed for motorized use. While NFS Trails 14E10 (Parsley Bar) and 14E14 (South Fork) coupled with proposed combined use on NFS Roads 13N28 (South Creek) and 17N12 (Soda Springs-Riverton) provide motorcyclists with a loop option accessible from the Airport Flat Campground, the change in type of use eliminates the only native surface non-motorized trail in the area.

Of the 1.7 miles identified with a change of use on NFS Trail 17E22 (Thunder Mountain Loop), 1.3 miles is coincident with NFS Road 10N16 (West Martin Meadow). The remaining 0.4 mile segment provides a link for motorcyclists between Martin Meadow campground and NFS Trail 17E21 (Silver Lake-Horse Canyon) which allows travel to destinations from Squaw Ridge (17E24 and 09N82), such as Plasse’s Resort and Bear River Reservoir. The short segment of trail is not contiguous with the main non-motorized portion of this trail and is located between two larger sections of motorized use. There may be an increase in the amount of motorcycle traffic traveling from Martin Meadow Campground to the Silver Lake-Horse Canyon trail which could adversely impact the quality of experience for non-motorized users traveling the Horse Canyon Trail and Thunder Mountain Loop by increasing noise, dust, and disturbance along the trail.

The 1.6 miles of NFS Trail 17E51 (Caples Creek) proposed for motorcycles is coupled with a change in type of use for NFS Trails 17E20 (Silver Fork) and 17E71 (Old Silver Lake) from motorcycle only to non-motorized. Motorcycle use in this area would be limited to a throughway along the Caples Creek Trail to NFS Road 10N14 (Mule Canyon). This provides riders with multiple route options and encourages them to pass through the Caples Creek drainage, limiting non-motorized users' exposure to the motorized use while allowing motorized users the opportunity to experience the area. The technical difficulty of the Caples Creek trail for motorcyclists will help to self-regulate the use to advanced and expert riders, minimizing the amount of use and impact to the non-motorized users.

A 0.9 mile segment at the beginning of NFS Trail 17E63 (Forgotten Flat) has been proposed for motorcycle only use in conjunction with an unauthorized trail originating from Highway 88 near Silver Lake. This trail serves to provide motorcyclists with a northerly route from the Highway 88 corridor. This allows motorcyclists to legally travel from Highway 88 as far north as Lover's Leap. Trail degradation and increased motorcycle traffic will adversely impact non-motorized trail users along the segment of Forgotten Flat proposed for motorcycle use.

Noise

Alternative B, along with the other action alternatives, increases the opportunities for quiet recreation uses by increasing the number of areas located at all four distances from roads and trails, thus decreasing the impact of motor vehicle noise on quiet recreation uses. The greatest potential of impact will be to those recreating in the System Ride & Play, Traditional Use, and Wildland Urban Interface recreation settings where traffic is more frequent.

In Alternative B, there would be a 44 percent increase in areas greater than 25 acres on NFS land which are further than 0.25 mile from proposed roads and trails over Alternative A. The majority of these areas fall in the 25-75 acre (113) and 75-200 acre (64) categories, while the number of areas greater than 500 acres in size has increased to 60. These larger areas have been introduced throughout the recreation settings, most notably in the High Country, Traditional Use, Scenic Corridors, Wildland Urban Interface and Water Focus. As the distance from roads and trails increases, the number of areas decreases to 134 for one-half mile, 42 for one mile, and 10 for two miles. In some cases, multiple areas appearing fragmented in Alternative A have been connected as single, larger areas. In other cases, single areas increased in size as the proposed system moved farther from the area. The 75-200 acre areas and 200-500 acre areas are distributed throughout the recreation settings, providing pockets of opportunity for quiet exploration and retreat.

Modified B

Motorized Recreation

Modified B includes the second highest mileage (1,847 miles) proposed in all the alternatives, equal to Alternative B. In Modified B, most native surface roads that allow public use are open to highway license and OHVs, providing additional motorized access in support of all recreation activities compared to the other action alternatives. This alternative provides the highest total mileage (1,123 miles) and the greatest percent of total mileage (61 percent) open to OHV use of any of the action alternatives. Forest wide, this alternative proposes the fourth highest mileage for motorized trails (210 miles), with motorcycle trail mileage (115 miles) greatly exceeding ATV trail mileage (58 miles) and 4WD trail mileage (37 miles). This alternative proposes the second most ATV trail mileage of all alternatives.

Modified B has the second highest mileage of existing NFS non-motorized trail proposed for motor vehicle use (1.7 miles) yet this is well below the 10.3 miles proposed in Alternative B. The 10.3 miles of NFS motorized trail not proposed for motorized use is the third lowest of all alternatives.

The seasonal closure proposed in this alternative is the same as that proposed in Alternative B and results in the same impacts.

Recreation Settings

High Country: Modified B decreases route density over-all in the High Country areas compared to Alternative A.

- Access proposed into Indian Valley is the same as Alternative B and results in the same adverse impacts to motorized recreation compared to Alternative A.
- Motorized use is limited in the Blue Lakes area to NFS road 09N01 (Blue Lakes) from ALP-5, to the parking area located approximately 0.30 mile from Meadow Lake, and the Clover Valley 4WD road (09N83) which has been proposed as NFS 4WD trail.
- Allen Camp Trail (17E19) is proposed for motorcycle use. This positively impacts motorcycle users but fails to provide a link for ATV users from the Silver Lake and Plasses Resort area to Mud Lake Road (17E24/09N04), Squaw Ridge (17E24/09N82) and Bear River Reservoir.
- Hunter’s Trail (14E09), Hale’s Crossing (14E04), and Deer Creek trail (14E11) are proposed for motorized use in this alternative. This positively impacts motorized recreation in the area as it provides expert motorcycle trail connecting the Ellicott’s Bridge with the Hell Hole Reservoir area and the Gerle Creek Reservoir area.

Scenic Corridors: Modified B maintains the over all function of motorized travel in the scenic corridors.

- Many of the short spur roads are proposed for highway licensed and OHVs, increasing dispersed recreation, especially hunting and fishing, opportunities on the Forest.

System Ride & Play: Modified B includes a high density combination of roads and trails in System Ride & Play areas providing for short and long loops and a range of recreational riding challenges.

- The addition of unauthorized routes to the NFS trail system in this alternative will enhance motorized recreation in the Gold Note area.

Traditional Use: Modified B decreases road density from Alternative A but still contains a dense system of roads, providing the most access of any of the action alternatives for OHVs.

- The addition of Baltic Ridge 4WD road (NSR1046-A) and allowing use on several adjacent spur roads for highway license and OHVs provides a number of dispersed camping opportunities in the Capps Crossing area.

Water Focus: Modified B decreases the overall route density in the Water Focus setting compared to Alternative A.

- The Barrett Lake 4WD road (11N26F) has been proposed to be converted to NFS 4WD trail.

- In the Mokelumne Canyon – Bear River area, the Sugar Pine Point road (08N20) from the Sugar Pine Point campground to Sugar Pine Tie road (08N21) is not proposed for motorized use. The exclusion of road 08N20 and the loss of the loop opportunity will negatively impact 4WD users, as well as ATV and motorcycle users.

Wilderness and Primitive Backcountry: Modified B generally decreases the number of roads and motorized trails within primitive backcountry areas, impacting motorized users of the Caples Creek Proposed Wilderness areas.

- This alternative does not propose motorized use on the Old Silver Lake Trail (17E71), the Silver Fork Trail (17E20), and the Caples Creek Trail (17E51) in the Caples Creek Proposed Wilderness.

Wheeled OST

Due to the seasonal closure on native surface roads, Modified B limits use to ML-3, -4 and -5 roads with no cross-country OST.

Dispersed Recreation

Of all the action alternatives, Modified B represents the least adverse impact to dispersed recreation, providing access to 65 percent of the dispersed sites inventoried. 80 percent of the dispersed sites accessible in Alternative A are accessible in this alternative.

Non-motorized Recreation

The changes to the NFS trail system proposed in this alternative represent an overall increase in quality, non-motorized trail experiences for NFS trail users, and results in the second least adverse impact to non-motorized forest visitors of all alternatives. The change in type of use for NFS Trail 17E22 (Thunder Mountain Loop) is identical to that proposed in Alternative B and results in the same impacts to non-motorized users.

Noise

See Alternative B for a general description of the potential impacts of noise on the recreation settings.

In Modified B, there would be a 43 percent increase in areas greater than 25 acres on NFS land which are further than 0.25 mile from proposed roads and trails over Alternative A. The majority of these areas fall in the 25-75 acre (113) and 75-200 acre (64) categories, although there are 55 areas 200-500 acres and 55 areas greater than 500 acres located one-fourth mile from roads and trails. Similar to Alternative B, these larger areas occur within most of the recreation settings, including the High Country, Traditional Use, Scenic Corridors, Wildland Urban Interface and Water Focus settings. As is expected, when the distance from roads and trails increases, the number of area sizes available for quiet recreation decreases, for example, there are 134 areas one-half mile from roads and trails, 42 areas located one mile, and 10 areas located two miles from roads and trails. Areas in Alternative A that were fragmented by roads and trails are now connected into single, larger areas.

Alternative C

Motorized Recreation

Of all the action alternatives, Alternative C has the third highest over-all mileage (1,730 miles) and mileage available for OHV use (757 miles). Forest wide motorized trail mileage available in Alternative C (177 miles) is the second to least proposed in any of the action alternatives. Mileage proposed for trails open to motorcycles only (89 miles) is the second least of all alternatives and the amount of mileage proposed for ATV trails (31 miles), although an increase from Alternative A, is the lowest of the action alternatives. Proposed 4WD trail mileage (57 miles) is only two miles less than that proposed in Alternatives B and Modified B.

This alternative does not propose any existing NFS non-motorized trails for motorized use but proposes the second highest mileage for existing NFS motorized trail not proposed for motorized travel (39.4 miles), adversely impacting motorized recreation.

Alternative C has the longest proposed seasonal closure with core from November 1 to April 30, a 6 month closure, covering 1,245 miles of roads and trails. Even though the Forest Supervisor has the authority to open areas of the Forest to motorized use in November, December, April, this seasonal closure will have the greatest adverse impact on motorized recreationists of all alternatives.

Recreation Settings

High Country: Alternative C decreases route density overall in the High Country areas from that proposed in Alternatives A and B.

- Access proposed into Indian Valley is the same as Alternative B and results in the same adverse impacts to recreationists.
- No motorized access has been proposed into Little Indian Valley. Recreationists will need to travel approximately 0.5 mile from ALP-114 to

- The trail combination including Horse Canyon Trail (17E21) and a segment of NFS non-motorized Thunder Mountain Loop (17E22) is not proposed for motorized use in this alternative. The exclusion of these trails for motorized use means that motorcyclists staying at Martin Meadow campground will need to trailer their OHVs to another location for use. Motorcyclists traveling Squaw Ridge (17E24/09N82) will no longer have the option of a through route to Highway 88 without turning down Mud Lake Road and will be required to turn around in the same location where 4WDs currently turn around. This will adversely impact motorcyclists who recreate in the area and eliminate existing trail riding opportunity.

- Little Round Top Trail (17E16) is not proposed for motorized use. This trail has contributed to illegal motorized use of the Pacific Crest Trail (PCT, 2000). Motorized users of the trail will be adversely impacted as their use will no longer be allowed on the trail.

System Ride & Play: Alternative C includes the same high density combination of roads and trails in most System Ride & Play areas as does Alternative B, resulting in the same benefits and impacts to motorized recreation when compared to Alternative A.

- In the Poho area, this alternative proposes fewer roads and trails open to motorized use than do Alternatives A or B. The benefit of this alternative to motorized recreation is limited as the proposed routes do not create a cohesive or well designed system.

Traditional Use: Alternative C proposes less roads in the Traditional Use areas than Alternative A but proposes the same as does Alternative B. Alternative C proposes less trails for OHV use than both Alternatives A and B.

Water Focus: Alternative C minimizes the OHV use proposed across all Water Focus setting areas, especially the Mokelumne Canyon – Bear River area.

- This alternative allows the same motor vehicle use of the Barrett Lake 4WD road (11N26F) as does Alternative B and results in the same impacts.

Wilderness and Primitive Backcountry: Alternative C decreases the number of roads and motorized trails within primitive backcountry areas from those proposed in Alternatives A & B.

- The proposed use for the Old Silver Lake Trail (17E71) and the Silver Fork Trail (17E20) in the Caples Creek Proposed Wilderness does not differ from that proposed in Alternative B and results in the same impacts to motorized use.

- Motorized use is not proposed on any portion of the Caples Creek Trail (17E51), negatively impacting motorized recreation. The remote and rugged experience provided by this area will be lost to motorcyclists skilled enough to negotiate the trail.

- Also in the Caples Creek Proposed Wilderness Area, NFS non-motorized trail 17E63 (Forgotten Flat) is not proposed for motorized use. This will eliminate the possibility of a motorcycle trail connection between the Silver Fork Road (11N40) area and Highway 88.

Wheeled OST

Alternative C proposes the same limitations to OST as those proposed in Alternative B which, when coupled with the seasonal closures, limits use to ML-3, -4 and -5 roads with no cross-country OST. The effects to OST are similar to Alternative B when compared to Alternative A.

Dispersed Recreation

This alternative would provide access to approximately 70 percent of the dispersed sites that are accessed in Alternative A, thereby impacting dispersed recreation slightly more than Alternative B. This alternative provides access to 57 percent of the dispersed sites inventoried and provides access to 74 percent of the dispersed sites in Alternative A that are within 300 feet of a road and within 300 feet of a stream or lake.

<u>Non-motorized Recreation</u>

Alternative C is the only alternative that does not propose any NFS non-motorized trail mileage for motor vehicle use. Additionally, 39.4 miles of NFS motorized trail is not proposed for motorized use. Based on these factors, this alternative has the second greatest positive impact to NFS Forest visitors interested in using ML-1 roads and trails for non-motorized recreation.

<u>Noise</u>

See alternative B for a general description of the potential impacts of noise on the recreation settings.

In Alternative C, there would be a 41 percent increase in areas greater than 25 acres on NFS land which are further than 0.25 mile from proposed roads and trails than exists in Alternative A. As in Alternatives A and B, the majority of areas located one-forth mile from roads and trails fall in the 25-75 acre (112) and 75-200 acre (66) categories. The number of areas 200-500 acres has increased by one and the areas greater than 500 acres has increased by 17 from Alternative A. Interestingly, the number of areas 200-500 acres has decreased by five and those greater than 500 acres has decreased by one from Alternative B. This is a result of the merging of areas within the Caples Creek Proposed Wilderness, Amador Upcountry and other High Country areas. Additional increases in areas 75-200 acres and 200-500 acres continue to be scattered across the recreation settings.

As the distance from roads and trails increases, the number of areas decreases to 130 for one-half mile, 40 for one mile, and 10 for two miles. With the merging of areas fragmented in Alternative B, the acres located one-half mile and one mile from roads and trails increase while the number of areas decreases. In some cases, single areas increase in size from Alternative B to C.

Opportunities for quiet recreation will increase in areas located one mile from roads and trails compared to Alternative A because noise reduction is more likely. Visitors in search of quiet recreation experiences will find additional opportunities with both the merging of large areas and the increased acreage of large areas from those found in Alternative B, including an area encompassing the interior of the Caples Creek Proposed Wilderness Area.

Alternative D

<u>Motorized Recreation</u>

Alternative D proposes the second lowest mileage (1,548 miles) over all and open to OHV use (642 miles) of all alternatives. Forest wide, Alternative D proposes the third highest motorized trail mileage (216 miles) 6 miles more than Modified B. This alternative proposes the fourth highest motorcycle mileage (113 miles), the second highest ATV trail mileage (47 miles), and the fourth highest 4WD trail mileage (56 miles).

Alternative D has the second least existing NFS non-motorized trail mileage proposed for motorized use (1.7 miles), equal to Modified B, and the third most existing NFS motorized trail mileage not proposed for motorized use (15.5 miles). All 15.5 miles of existing NFS motorized trail not proposed for motorized use in this alternative are motorcycle trail.

Alternative D has the second longest proposed seasonal closure prohibiting wheeled motor vehicle travel from December 1 to April 30 on 1,063 miles of roads and trails. Even though the Forest Supervisor can allow wheeled motor vehicle use during December and April if conditions permit, this five month seasonal closure will have an adverse impact on motorized recreation.

Recreation Settings

High Country: Alternative D decreases route density over-all in the High Country areas from Alternatives A—C. The decrease in NFS ML-2 roads proposed in this alternative will limit access to areas previously visited by hunters and other motorized dispersed uses.

- This is the only action alternative where motorized access is proposed within Indian Valley in the Blue Lakes area along Indian Valley 4WD trail (19E04). This route provides an out and back tour for high clearance vehicles through the meadow to the Mokelumne Wilderness boundary, accessing multiple dispersed use sites along the way. Inclusion of this route will benefit local residents and recreational visitors who have vested interest in continued motorized access of the valley.

- Access proposed into Little Indian Valley is the same as Alternative C and results in the same adverse impacts to motorized recreation when compared to Alternative A.

- In addition to 19E04, OHV use in this alternative is the same as that proposed in Alternative B and results in the same impacts to motorized recreation, compared to Alternative A.

- Motorized access in the Amador Upcountry area is nearly identical to that proposed in Alternative B with the exception of Allen Trail (17E19), which is proposed as motorcycle trail in this alternative.

- In this alternative, Mud Lake 4WD road (09N04) and the portion of Carson Emigrant trail (17E24) are proposed as NFS 4WD road open to OHV use, rather than NFS 4WD trail. This has no effect on motorized recreation.

- Hunter's Trail (14E09), an existing NFS motorcycle trail in the Georgetown North – Upper Rubicon area, is not proposed for motorized use from Ellicott's Bridge to Hale's Crossing (14E04). The trail from Hale's Crossing (14E04) north to Hell Hole Reservoir area, along with NFS motorcycle trails Hale's Crossing (14E04), and Deer Creek trail (14E11), is proposed for motorized use in this alternative. Although travel from Ellis Bridge is eliminated as a recreation option, the tie from the Gerle Creek Reservoir area and Hell Hole Reservoir area remains allowing some continued use of the area. This alternative will impact motorized recreation in the area more than Alternative A but less than Alternative C.

- Proposed motorized use on Strawberry Canyon 4WD road (10N13) is the same as that proposed in Alternative B and results in the same impacts when compared to Alternative A.

Scenic Corridors: The over all function of motorized travel in the scenic corridors is maintained in Alternative D, while proposing connections and through routes which enhance the motorized recreation system.

- Existing NFS motorized trails proposed in this alternative include: Lover's Leap (17E12), Horse Canyon Trail (17E21), and a segment of NFS non-motorized Thunder Mountain Loop (17E22).

System Ride & Play: Alternative D includes virtually the same high density combination of roads and trails in all System Ride & Play areas as does Alternative B, resulting in the same benefits and impacts to motorized recreation when compared to Alternative A.

Traditional Use: Alternative D proposes less roads and trails in Traditional Use areas than does Alternatives A and C. This alternative provides some level of access to most land within Traditional Use areas, while further decreasing the mileage available for OHV use on shorter roads where the use is inconsistent with adjacent roads. The decrease in direct access will inconvenience motorized dispersed recreationists in some locations.

- OHV connections are proposed between System Ride & Play settings and other OHV riding opportunities that pass through many of the Traditional Use areas. These connections will benefit those motorized recreationists who use OHVs and prefer longer rides.

Water Focus: Alternative D decreases the density of roads and trails proposed in Water Focus setting areas from that proposed in Alternatives A and C.

- In the Mokelumne Canyon – Bear River area, this alternative proposes an OHV connection between a nearby Traditional Use setting area and a High Country setting area. This maintains motorized use by allowing recreationists using OHVs increased opportunity for longer rides across a wider range of landscapes.

- This alternative allows the same motor vehicle use of the Barrett Lake 4WD road (11N26F) as does Alternative B and results in the same impacts.

Wilderness and Primitive Backcountry: Alternative D slightly decreases the highway legal road mileage within primitive backcountry areas from those proposed in Alternative C but the decrease is much larger when compared with Alternative A.

- This alternative maintains the same prohibition of motor vehicle use within the Caples Creek Proposed Wilderness Area as those included in Alternative C and results in the same impacts to motorized recreation.

Wheeled OST

Alternative D provides the most mileage open to wheeled OST of any of the action alternatives, but still much less than that available in Alternative A. It is the only action alternative providing for wheeled OST experiences along NFS ML-2 roads when conditions permit, potentially allowing wheeled OST on 1,548 miles of road. The alternative requires a 24 inch snow pack instead of the required 12 inch snow pack in the other alternatives. This requirement will be difficult to meet in many areas. Recreationists will be required to travel farther along ML-3, -4, and -5 roads before off-loading their OHVs for snow play on ML-2, -3, -4, and -5 roads.

In areas where ML-3, -4, and -5 roads are not plowed, it will be impossible for visitors to reach open roads with a snow depth of 24 inches in vehicles that are not highway legal. Where roads are plowed it may be possible for visitors to off-load OHVs for wheeled OST on unplowed designated roads with the required snow depth. In many cases, this will cause traffic hazards along plowed roads where recreationists park their tow vehicles. Since the Forest Service does not plow any ENF NFS roads, any roads plowed on the forest are done so at the expense of other groups or agencies and recreation opportunities are a side benefit of this activity. In most cases, the roadway plowed will not accommodate the parking of tow vehicles or the on- and off-loading of OHVs.

Dispersed Recreation

Alternative D would have the second greatest impact to dispersed recreation of the action alternatives. This alternative provides access to 55 percent of the dispersed sites inventoried, a reduction of 32 percent of the dispersed sites accessible in Alternative A. This alternative provides access to 26 percent fewer dispersed sites than Alternative A that are within 300 feet of a road and within 300 feet of a stream or lake.

Non-motorized Recreation

The changes to the NFS trail system proposed in this alternative represent an overall increase in quality, non-motorized trail experiences for NFS trail users, and results in the second least adverse impact to non-motorized forest visitors of all alternatives. The change in type of use for

NFS Trail 17E22 (Thunder Mountain Loop) is identical to that proposed in Alternative B and results in the same impacts to non-motorized users compared to Alternative A.

The proposed prohibitions to OST use are unique to this alternative and allow for both positive and negative impacts to non-motorized recreation. By allowing OST use on native surface roads, 1,547 miles are available. This increase has the potential to negatively affect non-motorized winter recreation as wheeled motorized vehicles tear up native surface roads and trails utilized for cross country skiing and snowshoeing. Conversely, this alternative requires 24" of snow on native surface roads for OST, compared to 12" in the action alternatives. The increased snow depth will decrease the days available for wheeled OST and thus minimize conflicts between uses and positively affect non-motorized recreation.

Noise

See alternative B for a general description of the potential impacts of noise on the recreation settings.

In Alternative D, there would be a 55 percent increase in areas greater than 25 acres on NFS land which are further than one-forth mile from proposed roads and trails than exists in Alternative A. This represents the largest increase in the number of areas of all the action alternatives, although Alternative E has the largest total acreage. As with other alternatives, the majority of areas located one-forth mile from roads and trails fall in the 25-75 acre (104) and 75-200 acre (78) categories. Additional increases in the number of areas 200-500 acre (65) and greater than 500 acre (61) located one-fourth mile from roads and trails represent clear increases in the quiet recreation opportunities in this alternative with notable concentrations of large contiguous areas located in the High Country, Scenic Corridor, and Wilderness and Primitive Backcountry settings. Decreases in the number of areas occur when the distance from motorized roads and trails increases to 154 for one-half mile, 47 for one mile, and nine for two miles. Changes from Alternative C in the areas located one mile from roads and trails include a return to fragmentation of one large area in the Amador Upcountry area of the High Country setting and a decrease in size of three other large areas in the High Country, Scenic Corridor, and Wilderness and Primitive Backcountry settings. Additionally, an area greater than 500 acres has been introduced into the Middle Fork American River area of the Wilderness and Primitive Backcountry setting.

Greater contiguous acreage is located one-forth and one-half mile from roads and trails for quiet recreation activities, in addition to the many smaller 25-75 acre and 75-200 acre areas scattered throughout the forest. Compared to Alternative C, this alternative provides less opportunity for escape from motor vehicle noise, as acres located one mile from roads and trails were decreased while fragmentation of the areas increased.

Alternative E

Motorized Recreation

Alternative E has the greatest adverse impacts to motorized recreation of all the alternatives. This alternative proposes the least motorized mileage of all alternatives (1,330 miles) including the least mileage open to OHV use (487 miles), the least motorized trail mileage forest wide (131 miles), the lowest miles of motorcycle trail (83 miles), the lowest miles of 4WD trial (13 miles) and the fourth highest miles of ATV trail (34 miles), only three miles less than Modified B.

Alternative E has the second least existing NFS non-motorized trail proposed for motorized use (1.2 miles) and the most existing NFS motorized trail not proposed for motorized use (47.3 miles) of the action alternatives. NFS motorized trails not proposed for motorized use in this alternative includes 37.9 miles of motorcycle trail, 0.7 miles of ATV trail, and 8.6 miles of 4WD trail.

The seasonal closure proposed in this alternative is the same as that proposed in Alternative B and results in the same impacts.

This alternative eliminates access for motorized users to many areas of the forest which greatly impacts their recreation opportunities, especially in the upper elevations of the High Country recreation setting. It does not propose a cohesive recreation system for motorized uses.

Recreation Settings

High Country: Alternative E proposes the least motorized vehicle access in High Country areas of all alternatives, decreasing the access for motorized dispersed uses and recreation opportunities from those proposed in all other alternatives.

- Access proposed into Indian Valley is the same as Alternative B and results in the same adverse impacts to motorized recreation.

- Access proposed into Little Indian Valley is the same as Alternative C and results in the same adverse impacts to motorized recreation compared to Alternative A.

- OHV use proposed along NFS roads 09N01 (Meadow Lake) and 09N83 (Clover Valley 4WD) is the same as in Alternative B and results in the same impacts to motorized recreation.

- Existing NFS motorcycle trails in the Amador Upcountry area are not proposed for motorized use and are the same as those not proposed in Alternative C resulting in the same adverse impacts to motorized recreation in the area compared to Alternative A.

- Motorized use proposed in the Amador Upcountry area is limited in the higher elevations to 17E24 from Highway 88 to Porthole Gap (NST1724-B), Porthole Gap (NST 1724-B), and a portion of Mud Lake 4WD (09N04); and in the lower elevations to Bear River road (08N03) and Ham Spring West road (08N03F). This adversely impacts motorized recreationists, eliminating opportunities for them to experience landscapes and vistas not available elsewhere on the forest.

- Mud Lake 4WD (09N04) and the portion of Carson Emigrant trail (17E24) are proposed as NFS 4WD road open to OHV use, rather than NFS 4WD trail. This has no effect on motorized recreation.

- Motor vehicle use will be prohibited on existing NFS motorcycle and 4WD routes in the Silver Fork – Strawberry area, including: Buck Pasture trail (17E17), Schneider Camp 4WD road (10N13, Strawberry 4WD) and Long Canyon 4WD road (10N21). The loss of these long established 4WD and motorcycle trails will adversely impact motorized recreation in the area, eliminating the quality recreation experiences and technical challenges associated with these routes.

Scenic Corridors: The overall function of motorized travel in the scenic corridors remains intact with this alternative; however, motorized recreation opportunities are nearly non-existent. This alternative adversely impacts motorized recreation within Scenic Corridors the most of all alternatives, especially for OHVs.

This alternative includes the same impacts in Scenic Corridor areas as does Alternative C compared to Alternative A.

- Schneider Camp 4WD (10N13) is not proposed for motorized use in this alternative. Access to the area will be limited to the Alpine County road (ALP-114) which ends at the Alpine County boundary with El Dorado County; approximately 0.75 mile from Schneider Cow Camp, a popular parking and off-loading area for equestrian and other dispersed uses.

System Ride & Play: Alternative E proposes a decrease in the density of road and trail mileage in all System Ride & Play areas from that proposed in all other alternatives. While still providing viable recreation opportunities in these areas, the loss of road and trail mileage in these high use areas will result in adverse impacts to motorized recreationists.

Traditional Use: Alternative E proposes the least mileage in Traditional Use areas of all alternatives. This alternative provides some level of access to most land within Traditional Use areas, while further decreasing the mileage available for OHV use on shorter roads where the use is inconsistent with adjacent roads. The decrease in direct access will inconvenience motorized dispersed recreationists in some locations.

Water Focus: Alternative E decreases the density of roads and trails proposed in Water Focus setting areas from that proposed in all alternatives. The OHV mileage proposed in Water Focus setting areas in this alternative is fragmented. This will adversely impact motorized recreation use of OHVs.

- The OHV connections proposed between recreation settings in Alternatives B and D in the Mokelumne Canyon – Bear River area are not proposed for in this alternative.
- The Barrett Lake 4WD road (11N26F) is not proposed for motorized use in this alternative.

Wilderness and Primitive Backcountry: Alternative E proposes the same motor vehicle use associated with primitive backcountry areas as that associated with Alternative D and results in the same impacts to motorized recreation compared to Alternative A.

Wheeled OST

Alternative E proposes the same limitations to OST as those proposed in Alternative B which, when coupled with the seasonal closures, limits use to ML-3, -4 and -5 roads with no cross-country OST.

Dispersed Recreation

Alternative E represents the greatest adverse impact to dispersed recreationists of all alternatives, providing access to only 49 percent of inventoried sites. This is a reduction of 40 percent of the dispersed sites that are accessible in Alternative A. This alternative provides access to 35 percent fewer dispersed sites than Alternative A that are within 300 feet of a road and within 300 feet of a

Of all alternatives, Alternative E provides the greatest opportunity for quiet recreation activities and potential success in escape from motor vehicle noise. In this alternative, there would be a 50 percent increase in areas greater than 25 acres on NFS land which were further than one-fourth mile from proposed motorized roads and trails over Alternative A. Although the number of areas located one-forth mile from roads and trails appears to be similar or less than Alternative D, the overall acreage represented surpasses that of Alternative D by over 26,000 acres. Areas greater than 500 acres located one-fourth mile from roads and trails are represented within all recreation settings and encompass much of the High Country, Scenic Corridor, and Wilderness and Primitive Backcountry settings. Alternative E contains the largest number of areas located at all four distances from roads and trails in all alternatives with 298 for one-fourth mile, 147 for one-half mile, 43 for one mile, and 10 for two miles. Unique to Alternative E, an area greater than 500 acres and located one mile from roads and trails provides potential low elevation escape in the Placerville Isolated area of the Wildland Urban Interface setting. An area greater than 500 acres is now found in the High Country setting connected to an area in the interior of the Caples Creek Proposed Wilderness area by a narrow band. The majority of the Amador Upcountry area in the High Country setting is also now located one mile or more from roads and trails. Also unique to Alternative E, an additional area greater than 500 acres is located two miles from roads and trails in the Silver Fork-Strawberry area of the High Country setting.

Cumulative Effects for All Alternatives

The cumulative effects analysis for recreation considers impacts of the alternatives when combined with the following past, present, and foreseeable future actions and events: routes both NFS and unauthorized, on the ground, management decisions, road and trail maintenance, road and trail construction, and population growth. These actions were selected because they have caused or have the potential to cause changes in recreation opportunities, public access or the creation of routes on the ground. The geographic scope (forest wide) of the cumulative effects analysis was selected because impacts to the recreation system in one area of the forest can affect the continuity of the system and public access opportunities in other areas. The temporal scope was selected because impacts to recreation and public access can continue over time. By identifying existing routes during the route inventory, we captured the network of routes attributed to past recreation use forest wide. The Rock Creek Recreational Trails area, NFS ML-3, -4, and -5 roads, and fire suppression activities including firelines were incorporated into the direct and indirect effects analysis.

Management decisions are directly responsible for maintaining the current route system, opening new routes, or closing existing routes. Active management that involves education, he teman continue eooads, and fire

The population in the counties surrounding the ENF, as well as the Sacramento area is expected to continue increasing. This will cause a continued urbanization of the Wildland Urban Interface and could adversely impact motorized recreation. An increase in the use of roads and trails for motorized recreation may increase the rate of rutting and general trail degradation and require increases in trail maintenance by both the Agency and volunteer organizations.

Noise

When routes not on NFS land are included in the analysis, decreases in the number of all four area sizes located one-fourth mile from roads and trails occur in all alternatives (Table 3-U.10 With the exception of Alternative E, which decreases with the one-mile buffer, increases in total acreage occur in areas located one-half mile and one-mile from roads and trails. Areas available for the greatest success in avoiding motor vehicle noise are limited to the High Country setting, the Wilderness and Primitive Backcountry setting, and small areas in the Scenic Corridor setting.

Table 3-U.10: Number of areas on NFS land and not on NSF land open for public wheeled motor vehicle use by Alternative and area size (in acres)

Area Size	A	B	Mod B	C	D	E
Located farther than 0.25 mile from roads and trails						
25-75	61	86	84	27	75	71
75-200	54	57	59	86	60	54
200-500	28	28	34	56	34	38
> 500	36	53	43	48	58	51
Total	179	224	220	217	227	214
Located farther than 0.5 mile from roads and trails						
25-75	13	18	17	16	21	23
75-200	10	15	14	12	12	14
200-500	10	15	16	16	20	22
> 500	13	16	12	14	19	15
Total	46	64	59	58	72	74
Located farther than 1 mile from roads and trails						
25-75	0	2	3	1	1	1
75-200	0	2	1	1	3	3
200-500	2	1	1	2	1	1
> 500	8	9	7	8	9	5
Total	10	14	12	12	14	10
Located farther than 2 miles from roads and trails						
25-75	0	0	0	0	0	0
75-200	0	0	0	0	0	0
200-500	0	0	0	0	0	0
> 500	2	2	1	2	2	2
Total	2	2	1	2	2	2

V. Visual Resources

Affected Environment

The Visual Resource Management System (VMS) is used by the Eldorado National Forest to analyze its visual resources. During the forest planning process, the Forest was mapped to classify the landscape into different classifications of visual attractiveness, or Variety Class. These classes determine the landscapes which are most important and those which are of lesser value from the standpoint the landscapes' richness, scale, and complexity of landforms; water forms; rock formations; and vegetative patterns, singularly or in combination. Travel routes, use areas, and water bodies were then analyzed to determine their Sensitivity Level (a measure of the public's visual expectations). These two processes were combined to determine the Visual Quality Objectives (VQOs) attributed to individual Forest Management Areas (MAs). VQOs are then used as management tools to describe allowable changes from a natural appearing landscape due to management practices on the land.

Based upon the Forest Land and Resource Management Plan, the goal for the visual resources is to protect the most visually sensitive areas of the Forest by placing major roads, trails, streams, and areas of concentrated visitor use in scenic corridors and managed viewsheds. General direction under the Plan requires that areas are to be managed to provide the viewing public a characteristic natural appearing landscape commensurate with the description slated for each VQO; and the improvement or rehabilitation of landscapes that do not meet VQOs. In addition to the Plan direction, it is recognized that the public has strong attachments to certain landscapes, or "special places."

The table below lists the managed viewsheds within the Forest, along with their associated VQOs.

Table 3-V.1: Eldorado NF Managed Viewsheds

Managed Viewsheds	Visual Quality Objectives	
	Foreground[1]	Middleground[2]
Wildernesses Desolation Mokelumne Caples Creek (proposed)	Preservation[3]	
Wild & Scenic Rivers – Wild classification N.F. Mokelumne R. (above Salt Springs Res.) Summit City Cr. (source to confluence w/N.F. Mokelumne R. Pyramid Cr. (6200' elev. To Avalanche Lake) Caples Cr. & unnamed trib. (proposed wilderness boundary to confluence w/Silver Fork American R. Rubicon R. (Ellicotts Bridge to Oxbow Res.)	Preservation[4]	
Wild & Scenic Rivers – Scenic classification Rubicon River (Hell Hole dam to Ellicotts bridge)	Retention	
Wild & Scenic Rivers – Recreation classification N.F. Mokelmune R. Bear R. (area within Mokelumne Special Interest Area (SIA) Beaver Cr. (area within Mokelumne SIA) Cole Cr. (area within Mokelumne SIA) Green Cr. (area within Mokelumne SIA) S.F. American R. (source to Blair bridge) Silver Fork American R. (Caples Cr. to confluence w/S.F.	Partial Retention	

American R. Pyramid Cr. (Hwy. 50 north to 6200' elev.) M.F. American R. (Oxbow Res. To Auburn) N.F. Cosumnes R. (Source to confluence w/main stem Cosumnes R.) M.F. Cosumnes R. (Source to confluence w/main stem Cosumnes R.)		
Roads Highway 50 (portion) ELD-63 Wentworth Springs (portion) 11N26 Wrights Lake Highway 88 ALP-122/10N01 Woods Lake 10N11 Kirkwood Lake 9N82 Pardoes 4WD 8N03 Bear River 4WD 9N04 Mud Lake 4WD	Retention	Retention
ELD-63 Wentworth Springs (portion) Highway 50 (portion) 10N50 Mormon Emigrant Trail 11N40 Silverfork ELD-147 Ice House Highway 88	Retention	Partial Retention
14N07 Lawyer Cow Camp 14N09 Chipmunk Ridge 17N12 Soda Springs - Riverton 14N25 Blacksmith Flat 14N08 Eleven Pines ELD-64 Volcanoville 12N80 Darling Ridge 12N87 Mace Mill 12N70 Rock Creek ELD-60 Mosquito 12N64 Sand Mountain Blvd 11N80 South Big X 11N58 Big Hill 12N30 Bryant Spring 11N37 Ice House Wrights Lake 13N22 Van Vleck Ranch 12N32 Millionaire Camp 12N59 Slab Creek 12N34 Forebay ELD-121Cable 9N73 Grizzly Caldor 9N30 Capps Reservoir 10N83 North/South 9N22 Buckskin Joe ELD-35 Omo Ranch 8N05 Panther Creek 8N25 Ellis 8N14 Tanglefoot Canyon 8N15 Penstock Cole 8N50 Salt Springs	Partial Retention	Modification
Trails 17E53 Kirkwood Lake Loop 16E30 Rubicon 17E46 Lake Margaret 17E21 Silver Lake – Horse Canyon 17E28 Long Valley 17E23 Granite Lake 17E19 Allen Camp	Retention	Retention

17E24 Carson Emigrant NRT 17E72 Minkalo 2000 Pacific Crest Trail		
14E09 Hunters Trail 15E08 Red Peak 15E21 Highland 17E14 Bryan Meadows 17E16 Little Round Top	Retention	Partial Retention
16E32 Two Peaks 4WD	Partial Retention	Modification
Community Views Georgetown Quintette Swansboro Pollock Pines Camino Grizzly Flat Omo Ranch Kirkwood Meadows	Retention	
Water Bodies Loon Lake Res. Gerle Creek Res. Wrights Lake Caples Lake Silver Lake Woods Lake Kirkwood Lake	Retention	Retention
Hell Hole Res. Stumpy Meadows Res. Slab Creek Res. Cody Lake Union Valley Res. Ice House Res. Lake Margaret Bear River Res. Salt Spring Res.	Retention	Partial Retention
Junction Res. Shealor Lakes	Partial Retention	Modification
Developed Recreation Sites Ski Areas Recreation Residence Tracts Organization Camps Administrative Sites	Partial Retention	

[1]Foreground = 0 – between ¼ - ½ mile from observer.

[2]Middleground = Foreground to between 3 – 5 miles from observer.

[3]Preservation = Allows ecological changes only; management activities except for very low impact recreation facilities are prohibited.

[4]Retention = Provides for management activities that are not visually evident.

[5]Partial Retention = Provides for management activities that remain visually subordinate to the characteristic landscape.

[6]Modification = Management activities may dominate the characteristic landscape however activities must borrow from naturally established form, line, color, or texture so that the visual characteristics are those of naturally occurrences within the surrounding area or character type.

Most of the Forest landscape is seldom seen by forest visitors. These lands are managed under MA 24 – High Site Timber. These areas are managed for a VQO of Modification.

Existing Visual Condition

The visual effects of roads and trails come from three viewpoints: (1) the view of the surrounding landscape as seen by travelers on the route; (2) the view of the route corridor itself (including cut and fill slopes and road template) as seen by travelers on the route; and (3) the view of the route by forest visitors looking from other areas (e.g. boat on a lake). The positive and negative visual effects of roads and trails are relative to the perspective of the observer along with the activity they are performing. The distance from which the landscape is being viewed is an important component of the VMS system. Landscape elements are perceived very differently when viewed from a mile away versus twenty feet away. For example, from a mile away a waterfall is visible because of a color and form differentiation. When viewed from twenty feet away, all of the details including boulders, spray, and individual rivulets are discernable.

Viewpoint from the route looking at the surrounding landscape: The view of the surrounding landscape from the route is affected by past management activities and human use, and include past timber management practices, fuels management treatments, the results of human-caused wildfire, evidence of grazing, and resource damage due to concentrated recreational use. The acceptability of the deviations from a natural-appearing landscape, are based on the scale, magnitude of contrast, duration of observation time, and the individual visitor expectation. Another major factor in perceiving visual impacts is whether the alterations are visible in the foreground or the middleground. Details such as changes in texture are far more noticeable in the foreground. Changes in color, line, and landform can be obvious in the middleground.

Viewpoint from the route looking at the route: Scenic quality and enjoyment of the traveling experience from within the route corridor can be dependent upon the design of the route itself. Experiential impacts are derived from the alignment, grades, surface, risk/safety factors, and physical comfort. Forest route designs typically include relatively narrow widths, tight curves, mostly native soil surfaces, small cuts and fills, encroaching vegetation, fractured rock embankments, and simple drainage structures. Scenic quality of the route corridor is greater when the variety in the surrounding landscape is brought into the design of the corridor. For example, distinctive rock outcrops are left as part of the embankment or old-growth character trees stand as a focal point within the immediate foreground. Vista points can be a planned or an unintentional by-product of the route location. Some of these locations or landscape features have a very personal 'sense of place' for individuals who attach a memory to them or regularly travel the route.

Viewpoint from another location looking at the route: Routes themselves can have a negative visual impact when viewed from other areas. The major impact comes from the linear configuration upon a non-linear landscape. Deviations in color and texture from soil and vegetative disturbance can contrast with the surrounding landscape. This effect is most noticeable when viewing large, open landscapes from a middleground distance.

The existing visual condition across the Forest varies between viewsheds. From most locations within managed viewsheds the visual effects of existing roads and trails on the landscape is non-existent. Vegetative and landform screening precludes most possibilities to view Forest routes. In the foreground, evidence of unauthorized routes may be obvious in flatter and open areas where motor vehicle use is heavy. Soil disturbance and loss of vegetation in these areas can have a negative visual impact. From some vantage points in the Forest where large land-disturbing events have occurred such as wildfire, the existing road system stands out as a dominant feature. The negative visual effect is greater from viewpoints where panoramic views are available. Routes that were previously unnoticed because of tree cover become unnatural-appearing disturbances until the trees grow back to a substantial height. Depending on the observer's position in the affected landscape (for example a vista point high on a mountain) the negative visual impact can last for many years.

Analysis Framework

Introduction

The proposed alternatives have the potential to affect both the visual resource itself, as well as forest visitor's opportunity to view the resource. The type of visual experience can be different depending on whether the landscape is viewed from a motorized or non-motorized mode of travel. The type of motorized travel is not addressed in this section. The following are the visual resource issues analyzed in each alternative:

- The linear configuration, texture, and color variations associated with both NFS and unauthorized routes result in deviations from the natural appearing landscape. The change in route density may have a negative or positive effect on the foreground and middleground views of managed viewsheds.
- The public may lose the opportunity to view 'special places', unique features, or panoramic vistas due to routes not being designated open for public wheeled motor vehicle use.
- The occasion to view effects of past management practices will be lessened with limited motorized travel opportunities.

Data & Assumptions

For a discussion of the data and assumptions used in this analysis see the beginning of Chapter 3.

Indicator Measures

Indicator Measure 1: Visual impact to the natural-appearing forested landscape as viewed in managed viewsheds.

Indicator Measure 2: Public wheeled motor vehicle access to 'special places' on the Forest.

Indicator Measure 3: Effects of forest management activities on visual quality from a motorized perspective.

Environmental Consequences

Effects Common to all Alternatives

The Eldorado NF assigns different Sensitivity Levels to roads and trails on Forest Service lands. Generally, roads and trails that are used by large numbers of recreationists and have a high scenic quality are given a Sensitivity Level designation of 1 or 2. Although all lands on the Eldorado NF are managed for visual quality, the Sensitivity Level 1 and 2 road and trail viewsheds are managed with higher standards and guidelines than the remainder of forest routes. Roads that were built for hauling timber and other forest management purposes (NFS ML-1 and ML-2 roads) do not have associated managed viewsheds. None of the routes that the Eldorado NF manages as Sensitivity Level 1 and 2 viewsheds or scenic corridors (see table 3-129) are proposed for closure under this analysis.

Alternative A

Direct and Indirect Effects

Indicator Measure 1: Under this alternative, the existing condition would continue, as described in the description of Alternative A in Chapter 2, as well as the Affected Environment for this section. More routes will remain open and in use under this alternative; therefore, Alternative A has the highest degree of negative visual impact to the natural-appearing forested landscape as viewed from managed viewsheds. In areas where wildfire has burned large expanses of the landscape, routes that were previously unnoticed because of vegetation have become exposed. From middleground views, the linear configuration of the routes is made evident by color variations and is a noticeable contrast to the natural appearing landscape. Viewsheds affected include the Ice House Road, Union Valley Reservoir, Big Hill Vista, Highway 50, and Ellis Road.

Foreground views are affected by quantity, scale, and degree of contrasting elements compared to the surrounding natural-appearing landscape. Managed viewshed travel corridors are typically associated with NFS ML-4 and -5 roads and heavily used trails. The quantity and condition of route intersections coming into the managed viewshed interrupts the sequential repetition of landform and vegetative patterns. The visual effect of unauthorized routes is usually negative due to the associated ground and vegetative disturbance. A landscape or viewshed with less evidence of human activity in general is of a higher visual quality.

Indicator Measure 2: Under this alternative, there is an opportunity for the most people to visit a variety of locations within the Forest. Many obscure places have special meaning to people because of created memories, unique landscape features, or beautiful vistas that exist across the Forest. They may be in a traditionally visited dispersed camp site, a random location along an NFS ML-2 road, or at the end of an unauthorized route. These locations may require motorized travel in order to visit in a realistic time-frame and context. Alternative A provides the public easy access to these special places. The opportunity for new visitors to acquire attachments to special areas has a higher potential because of more land easily available for their exploration.

Indicator Measure 3: The majority of ML-1 roads were built to access forest management activities such as timber sales and fuels reduction projects. Evidence of some of these activities is still visible. In many cases, the managed units contrast with the surrounding natural appearing landscape and therefore have a negative visual impact. Some of the roads built to access these areas are now used by the public to access dispersed campsites, vistas, fishing opportunities, shooting areas, and other recreational activities.

Under Alternative A, all of the routes are accessible by motorized vehicles. This alternative allows the most likelihood for the most people to view negative visual impacts resulting from management activities on more acres of land.

All Action Alternatives

Direct and Indirect Effects

Indicator Measure 1: Under these alternatives many miles of existing routes would not be designated for public wheeled motor vehicle use. Although the mileages vary by alternative, the effect to the visual resources of the differences between B, Modified B, C, D and E is relatively small when compared to the difference of open routes in Alternative A.

The majority of routes affected under these alternatives are currently NFS ML-1 roads. Because many of these roads were constructed in concert with past timber sale projects and fuels management projects, their density within specific areas is relatively high. Over time, natural re-vegetation would occur within the route templates obscuring the constructed appearance and reducing contrast with the surrounding landscape. A more natural appearing landscape across the Forest would result with less evidence of human activity. The improved visual quality would be most evident in the foreground from NFS ML-3, -4, and -5 viewsheds which previously accessed timber management areas (e.g. 09N22 – Buckskin Joe Rd.). Many unauthorized routes would also not be designated, and over time, the intersections would be unnoticed in the foreground.

Following natural re-vegetation, routes not designated that are viewed in the middleground would not be noticed. The overall intactness of the mostly uniform forested landscape would improve the visual quality across the Forest when viewed from available observation points and vistas within managed viewsheds (eg. Big Hill Vista).

Indicator Measure 2: One of the issues that factored into whether a route was proposed for designation in the action alternatives was if the route accessed ‘special places’ on the Forest. This information was collected from public input and Forest Service specialists. These places include dispersed campsites, vistas, special landscape features, and other areas that have personal meaning to individuals. Under these alternatives, various routes that were identified are proposed to be designated for public wheeled motor vehicle use.

Routes that were identified as accessing ‘special places’ may not be designated for motorized use under some of the alternatives due to conflicts with Forest Plan Standards and Guidelines or other resource concerns. In addition, for a variety of reasons, there may be other ‘special areas’ that were not identified because not every forest visitor submitted input into the process. Although these areas may continue to be accessible by non-motorized means, visiting them by means other than motorized travel may not be feasible.

Under these alternatives, there is less opportunity for the public to experience the variety of scenic beauty that the Forest has to offer than under Alternative A. Assuming miles of available easy access (motorized) can be directly correlated to acres of potential scenic opportunities (by the highest number of people), the alternatives with more available motorized routes would be preferable to the alternatives with lower available motorized routes.

Indicator Measure 3: Under alternatives B, Modified B, C, D, and E, there is less opportunity for the public to view landscapes altered by management activities than under Alternative A. Assuming miles of available easy access (motorized) can be directly correlated to acres of potential negative visual impacts resulting from management activities (seen by the highest number of people), the alternatives with less available motorized routes would be preferable to the alternatives with higher available motorized routes from a visual standpoint.

Cumulative Effects

Indicator Measure 1: The same as described under Direct and Indirect Effects above.

Indicator Measure 2: Special places have a very personal meaning and effect on each individual. Therefore the cumulative effect of this indicator measure has many possibilities that are impossible to fully capture, to quantify or to qualify. It is possible that Eldorado N.F. visitors, no longer able to visit their “special places” by motorized travel may choose to use other allowable means to visit those areas such as hiking or mountain bike riding. These uses may increase across the forest. In contrast, they may choose not to visit those places anymore in which case there is no way to understand their loss of experience and the effect it may have on them. Others may choose to recreate in other areas which may create impacts on the associated resources.

Indicator Measure 3: With less occasion to view management activities which result in a negative visual quality, the overall landscape available to be viewed may appear more intact.

W. Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Alternatives B, M, C, D, and E respectively from most to least, all have the potential to improve the long-term productivity by reducing the number of existing routes on the landscape. Routes that are not designated for public wheeled motor vehicle use will have the potential to revert to vegetated conditions, which will reduce many of the adverse effects related to these routes.

Unavoidable Adverse Effects

Implementation of any of the alternatives would result in some unavoidable adverse environmental effects. Although formation of the alternatives included avoidance of some potential adverse effects, some adverse effects could occur that cannot be completely mitigated. The environmental consequences section for each resource area discusses these effects.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

It is not anticipated that designating, or not designating, some existing NFS and unauthorized routes for public wheeled motor vehicle use would cause an irreversible or irretrievable commitment of resources.

Cumulative Effects

Cumulative effects are addressed for each resource area in the environmental consequences section.

X. Other Required Disclosures

National Environmental Policy Act of 1969

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

This EIS has been prepared in accordance with the following regulations:

National Historic Preservation Act (NHPA) of 1966

Section 106 of the NHPA of 1966 requires federal agencies to consider the potential effects of a Preferred Alternative on historic, architectural, or archaeological resources that are eligible for inclusion on the National Register of Historic Places and to afford the President's Advisory Council on Historic Preservation an opportunity to comment. Section 110 of the Act requires federal agencies to identify, evaluate, inventory, and protect National Register of Historic Places resources on properties they control. Potential impacts to archaeological and historic resources have been evaluated in compliance with Section 106 of the NHPA.

Executive Order 11644 – ORV Management

Executive Order 11644 – Use of Off-Road Vehicles on Public Lands (issued February 8, 1972) – provides for the establishment of policies and procedures that will ensure that the use of OHVs on public lands will be controlled and directed so as to protect the resources of those lands, to promote the safety of all users of those lands, and to minimize conflicts among the various uses of those lands. Agency heads are directed to provide for administrative designations of the specific areas and trails on public lands on which the use of OHVs may be permitted, and areas in which the use of OHVs may not be permitted.

Executive Order 11989 – ORV Management

Executive Order 11989 – Use of Off-Road Vehicles on Public Lands (issued May 24, 1977) – clarifies agency authority to define zones of use by OHVs on public lands. Agency heads, when they determine that the use of OHVs will cause or is causing considerable adverse effects on the soil, vegetation, wildlife, wildlife habitat, or cultural or historic resources to immediately close such areas or trails to the type of OHV causing such effects, until such time that it is determined that such adverse effects have been eliminated and that measures have been implemented to prevent further recurrences.

Executive Order 12898 – Environmental Justice

Executive Order 12898 – Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (issued February 11, 1994) – requires that each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high or adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. The preferred alternative does not disproportionately affect minority and low-income populations.

Clean Water Act

The Clean Water Act, as amended, regulates the dredging and filling of freshwater and coastal wetlands. Section 404 (33 USC 1344) of the Clean Water Act prohibits the discharge of dredged or fill material into waters (including wetlands) of the United States without first obtaining a permit from the U.S. Army Corps of Engineers. Wetlands are regulated in accordance with federal Non-Tidal Wetlands Regulations (Sections 401 and 404). No dredging or filling is part of this proposed action and no permits are required.

Clean Air Act of 1970

The Clean Air Act of 1970 and its amendments provide for the protection and enhancement of the nation's air resources. No exceeding of the federal and state ambient air quality standards is expected to result from the proposed action.

Endangered Species Act (ESA) of 1973

The Endangered Species Act of 1973 (16 USC 1531 et seq.) requires that any action authorized by a federal agency not be likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of habitat of such species that is determined to be critical. Section 7 of the ESA, as amended, requires the responsible federal agency to consult the USFWS and the National Marine Fisheries Service concerning endangered and threatened species under their jurisdiction. Biological evaluations for Proposed, Endangered, Threatened, and Sensitive (PETS) species have been prepared for the proposed action and informal consultation with the USFWS is ongoing.

National Forest Management Act (NFMA) of 1976

The National Forest Management Act of 1976 amends the Forest and Rangeland Renewable Resources Planning Act of 1974 and sets forth the requirements for Land and Resource Management Plans (Forest Plans) for the National Forest System. The proposed action is consistent with the NFMA and the Forest Plan for the ENF.